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ABSTRACT

A study was conducted to achieve the following objectives: (1) to determine the computer skills level of the vocational teachers in Southern Nevada; (2) to design a computer literacy inservice program targeting the specific instructional needs of vocational teachers with deficient skills; (3) to develop a plan for evaluating the inservice training program; and (4) to develop an implementation plan for continued computer literacy inservice training and an undergraduate computer literacy training program for vocational teachers in university teacher training programs. A questionnaire was mailed to 43 vocational teachers and returned by 37, for a response rate of 86 percent. The same questionnaire was used for personal interviews with an additional 78 teachers. The following were among the findings: (1) 50 percent of the vocational teachers in Southern Nevada were not computer literate; (2) 100 percent of electronics teachers were computer literate; (3) 73 percent of drafting teachers were computer literate; (4) 14 percent of welding teachers were computer literate; (5) there were no significant statistical differences in computer literacy levels between secondary and postsecondary teachers or between teachers receiving content area training from different college and industry sources; (6) 62 percent of the computer literate vocational teachers indicated that they were self-taught; and (7) 71 percent indicated that they learned their computer skills after beginning to teach. The document provides an 11-page bibliography and an appendix that includes the survey form and materials related to a proposed computer literacy workshop (assessment forms, a list of performance objectives, and detailed lab assignments). (CML)

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**DETERMINING THE COMPUTER LITERACY LEVELS OF
VOCATIONAL TEACHERS IN SOUTHERN NEVADA
AND DEVELOPING A COMPUTER IN-SERVICE
PROGRAM FOR VOCATIONAL TEACHERS**

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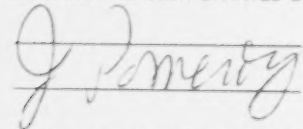
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by

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**A Major Applied Research Project presented in
partial fulfillment of the requirements for
the degree of Doctor of Education**

Nova University

June 1990

CE 055 962

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Abstract of a Major Applied Research Project Presented
to Nova University in Partial Fulfillment of the
Requirements for the Degree of
Doctor of Education

DETERMINING THE COMPUTER LITERACY LEVELS
AND DEVELOPING A COMPUTER IN-SERVICE
PROGRAM FOR VOCATIONAL TEACHERS
IN SOUTHERN NEVADA

by

James L. Pomeroy

June, 1990

Clark County Community College Computer Graphics
Department program director, was approached by Southern Nevada
community college faculty members, secondary vocational/technical
teachers, and local vocational leadership and asked to develop a
computer literacy program for the state's vocational teachers. The
most optimistic computer literacy studies conducted nation-wide in
the last five years indicated that at least fifty percent of teachers in
all disciplines lacked computer literacy. With the need for a program
established by prior studies and local requests, this study was
designed to determine the extend of need prior to the college
committing resources for program implementation.

The study methodology included a combination of procedures.
A literature search was conducted to identify the competencies
required for computer literacy and as the questioning strategy for the

survey instrument. A descriptive study and interview process were conducted using a survey instrument to obtain data.

All of the vocational/technical teachers in Southern Nevada were surveyed to determine their precise computer skills levels and how many were or were not computer literate. Research questions included (1) what skill areas constitute computer literacy; (2) what specific computer skills did the individual vocational teachers possess; (3) what levels or types of previous formal or industrial education impacted computer literacy levels; (4) which content areas provided computer education; (5) what demographic conditions impacted vocational teacher computer literacy; and (6) where do computer literate teachers obtain their training?

The purposes of this study were to (1) conduct a study to determine the computer skills level of the vocational teachers in Southern Nevada; (2) design a computer literacy in-service program targeting the specific instructional needs of the deficient vocational teachers; (3) develop a plan for evaluating the in-service training program; and (4) develop an implementation plan for continued computer literacy in-service training and an undergraduate computer literacy training program for vocational teachers in university teacher training programs.

The literature review addressed the first research question by providing the specific competencies for determining the characteristics of computer literacy and identifying the specific questions for the survey instrument. The competencies necessary for computer literacy are (1) hardware literacy; (2) word processing; and (3) advanced program operation, spreadsheet, database,

gradebook program, or computer-assisted design (CAD) or the ability to write a simple computer program.

The results of the study indicated that fifty percent of the vocational/technical teachers in Southern Nevada are not computer literate. A few content areas, specifically electronics and drafting, had exceptionally high rates of computer literacy, with 100 percent for electronics and seventy-three percent for drafting. Some content areas, welding at fourteen percent and graphic arts at thirty percent, had exceptionally low levels of computer literacy. The survey data indicated no significant statistical differences in computer literacy levels between secondary and postsecondary teachers, and no statistical difference based on industry or formal university training.

The demographic factor of age was determined by study data to not be a significant impactor on computer literacy. The data on differences based on gender were inconclusive as less than ten percent of teachers surveyed were women. Sixty-two percent of the computer literate vocational teachers surveyed indicated that they were self-taught, and seventy-one percent indicated that they learned their computer skills after beginning to teach. This provided substantial evidence that industry and formal educational institutions have provided very little computer training for vocational teachers.

The conclusions reached by the study were that the need for computer literacy training in Southern Nevada does exist. With an accurate estimate of the potential student enrollment identified by the study, the Clark County Community College can commit resources for a program. It is recommended that the college implement the Teacher Computer Literacy Workshop model

beginning the first semester of school year 1990-1991 and the University of Nevada system implement this or a similar computer literacy component in their teacher training programs.

The final product of this study was the development of a computer literacy training program specifically designed to address the needs of the Southern Nevada vocational teachers. The Teacher Computer Literacy Workshop program design, goals, competencies, instructional media, unit and program evaluation, and revision procedures were elements addressed in the design process.

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Chapter 1

INTRODUCTION

The computer education pioneer Andrew Molnar (1973:1) once remarked about the power of the computer in education when he stated, "Computing is so compelling a tool that it cannot be stopped." The transition of America from an industrial to a technical society as documented by noted social researchers, Bell (1973) and Toffler (1981), outlined the current and future need for more technologically capable and computer skilled citizens. Groff (1984:44) wrote, "A computer-literate populace is the energy and raw material in an information-based society." All education systems from primary through post-graduate education that currently exist and hope to exist in the future must deal with computer issues if our education system is to keep pace with Toffler's "wave" of technological advancement (Wollman, 1982).

New standards for literacy in America must include computer literacy for teachers as well as students. A computer educator (Watt, 1983:106) succinctly stated the importance of teacher computer literacy when he said, "It is hard to imagine students becoming computer literate without computer literate teachers." Another educator noted:

It is today a rare school that has even one teacher who uses computers as an everyday tool in coping with the problems of his or her discipline. This then is the major problem. We are asking computer-illiterate teachers to help students become computer literate at a functional level (Morsund, 1982:128).

Rapid changes in technology, particularly the infusion of computer applications in most vocational/technical trades, have created a climate that essentially requires vocational teachers to be computer literate.

Many vocational instructors, locally and nationwide, come to the classroom from the industrial instructional model rather than the university instructional model. Logic would indicate that without formal computer instruction in a college setting, most vocational teachers should be deficient in computer skills. However, industrial applications of computers have provided some instruction for some vocational instructors, but the depth of individual understanding is difficult to project and the specific content areas providing industrial experience in computer skills are not universally documented.

The collegiate model for vocational teacher education in recent years has offered some computer literacy instruction for a few teachers. Computer literacy instruction however, is not consistently or universally offered to potential teachers. College faculties make the problem even more complex by not establishing a consensus that computer education is worthwhile or necessary for college students. Many faculty members actively oppose computer application or instruction (Townsend and Hale, 1981).

The need for computer literacy for vocational teachers is a modern reality. With the establishment of standards for specific skills and levels and the development of a program for teacher education, vocational/technical educators will have access to the skills necessary to be not only current in technological industry, but to be innovators as well (Kapp and Knickerbocker, 1983).

Background and Significance

During this decade, computers will begin to influence every aspect of our daily lives. Already advanced technology is evident in offices, factories, schools, and homes. Visibly and invisibly, computers are shaping society. Most of us can't go through a single day without coming in contact with some form of advanced computer technology (West, 1983:2).

Modern America could not have anticipated or prepared for the sudden infusion of computer technologies into general society and educational institutions. As peripheral technology related to the post-sputnik burst of scientific research, Hooper and Mandell (1984) documented the introduction of the computer into American universities as the first educational applications of computer technologies. Hooper and Mandell also indicated that most major innovations and research breakthroughs in computer-based learning took place in American colleges. From the collegiate origins, educational computer applications have been disseminated to the elementary and secondary schools by the youngest and the brightest college students (Pantiel and Peterson, 1985).

In spite of the fact that the American college is the birthplace of computer-based learning, the computer has not been universally accepted and adopted at the postsecondary level (Apple, 1987). Many educational administrators at the postsecondary and secondary levels are not convinced that computers have use or merit in the educational setting and are actively opposing the spread of computers in education (Duttweiler, 1983 and Smeltzer, 1983). Noted futurists Toffler (1981) and Naisbitt (1984) documented the trend of educational and industrial leaders to oppose universal

adoption of computer technology, writing of the "techno rebels," or those articulate, educated, and wealthy people who resist technological change.

A lack of commitment on the part of college faculty to computer education has sent a generation of school teachers into the classroom with limited computer skills at best. A general survey on computer literacy conducted by IBM produced data that indicated less than fifty-two percent of America's teachers, in all disciplines, considered themselves computer literate. Mary Hatwood Futrell, the outgoing President of the National Education Association, when asked to respond to these figures, said:

Teachers are saying that technology has a place in the classroom, but they have to be given the training to use the equipment for personal use or as a teaching instrument. ("Teachers Lack Literacy," 1989:B1)

Wide-spread and continuing resistance to computers among teacher-training faculty has compounded the difficulty in assuring that vocational teachers are computer literate.

Solutions for educational computer issue problems are already being implemented in many educational environments. Significant human and fiscal resources have been expended in the last five years to identify the specific computer skills that teachers in different content areas must know. Additionally, educational technologists in recent years have worked to provide instructional faculties at all levels the opportunity to become knowledgeable about the many varied applications of computer technology in educational environments (Hernandez-Logan, 1982). Recent research is beginning to create a data-base of information that will someday allow

interested institutions and governing bodies the means by which to create viable policies and programs. The futurists (Toffler, 1981; Naisbitt, 1984; and Groff, 1986) are concerned that the research and implementation processes for technological education and adaptation to industry are progressing too slowly, and the failure to develop a more timely model for response to these new technological needs may imperil the economic and technological superiority of the United States. An educational technologist recently illustrated this point when he said:

About twenty years ago, educators earnestly debated the likely impacts of computers on schools. As the debates progressed, a generation of kids grew up and invented much of today's technology. In particular, they helped create the microcomputer, a tool that already promises to alter how we learn and teach (Zamora, 1983:6).

Educational decisions related to technology are going to have to be made more quickly and involving more resources than required in the implementation of older technologies, and the decisions will have to be more accurate and more informed than ever before. Most computer experts believe that there is still much more research that must be conducted about computer applications in education if the decisions are to be viable (Mustafa, 1987). Alvin Toffler, in The Third Wave, stated: "Whether we know it or not, most of us are already engaged in either resisting--or creating--the new technological civilization"(Toffler, 1981:6). The goal of this Major Applied Research Project (MARP) was to provide more information and data to improve the potential for making accurate and informed technology decisions at the local level.

Statement of the Problem

The Clark County Community College Computer Graphics program director was informally approached in 1989 by the State Vocational Teachers Association and requested to develop and provide computer literacy instruction for vocational teachers. Within the same time period, approximately one-third of the vocational/technical teachers in the Industrial and Services Technologies Division of the Clark County Community College approached the faculty members of the computer graphics program requesting similar instruction. Additionally, several local vocational high school teachers contacted the computer graphics department in search of an in-service program for computer instruction. Requests by the state organization and the individual vocational teachers provided evidence that a computer literacy in-service program of some variety was needed.

A review of literature indicated that many teachers in all disciplines are deficient in computer literacy training (Mustafa, 1987). A study of Nebraska schools in 1981 indicated that while ninety-six percent of the state's secondary and postsecondary teachers thought that students should be computer literate, only seventeen percent of the states teachers were computer literate (Stevens, 1984). In 1983, the National Education Association conducted a study of members related to their computer training. Seventy-nine percent of the national membership responded that they had no computer training (Killian, 1984). A survey of practicing

teachers at all instruction levels in the state of New Jersey, conducted in 1986, determined that sixty-one percent of the surveyed teachers had never had any instruction or coursework in computer studies (Wepner, 1986). The IBM sponsored study in 1988 on teacher computer applications indicated that only about half of all public school teachers consider themselves computer literate ("Teachers Lack Literacy," 1989).

The modern demands of technology in society, business, and education require that almost all teachers must eventually become computer literate (Watt, 1983). The apparent lack of universal computer training and the modern demands of computer applications for vocational teachers indicated a need for computer training for these teachers, as well as further study into the scope of the problem at the local level.

Prior to this Major Applied Research Project, no program for teacher computer instruction at the undergraduate or graduate level existed in any of the colleges of the University of Nevada System. Vocational teachers graduating from Nevada's colleges were not receiving adequate computer training preparation. Students in Nevada colleges of education are not required to take computer coursework and no courses were provided in the teacher training program. The demands of the education programs in Nevada, as four-year programs, allow for few elective courses in most programs and no electives in a few of the programs. Without the requirement of computer coursework and the discouragement of electing for it, computer training for vocational teachers in Nevada universities has been almost non-existent.

The preliminary evidence, based on teacher requests, previous study data, and the lack of computer literacy training for potential vocational teachers, indicated the need for computer literacy in-service training for vocational/technical teachers and warranted additional statistical study. Having determined a need for a training program at some level, the next major problem was to determine the scope of need and the nature of the training program to be designed. The statistical study was designed to provide the information necessary for determining the scope of need and for assisting in the design and implementation processes.

A recent Nevada State Regents policy change allocating non-degree remedial instruction and in-service programs to the local community colleges has placed in-service program development within the jurisdiction of the community college. With the need for a computer literacy in-service program for practicing vocational teachers determined to exist, the Clark County Community College would probably be assigned the responsibility of developing such a program, as it is the largest community college in the state and the only community college with the resources to conduct major or complex in-service instruction.

Clark County Community College is located in the southern corner of Nevada. The service area for the college encompasses four counties and is approximately the size of the state of Virginia. The population base for the college represents sixty-two percent of the total state population with the college enrollment growing at an average yearly rate of twenty percent.

With resources and facilities already over-burdened and a new program apparently needed, the scope and nature of the need had to be determined before a program could be successfully developed and implemented. Allocating resources to develop and conduct an in-service program for vocational teachers could only be successfully accomplished if the college and department knew precisely the percentages of the potential student population affected by the program, the precise number of potential students the program will service, and what skill levels the potential students already possess.

The preliminary evidence indicated a need to develop a computer literacy in-service program of some type or variety. An initial logical effort was, therefore, to determine the scope of the need for this program by determining the numbers of potential students that could benefit from the program, and next to ascertain the scope and design of the in-service program based on the existing skill levels of the potential students.

Purposes

The purposes of this Major Applied Research Project (MARP) were to (1) conduct a study to determine the computer skills level of the vocational teachers in Southern Nevada; (2) design a computer literacy in-service program targeting the specific needs of the deficient vocational teachers; (3) develop a plan for evaluating the in-service program; and (4) develop an implementation plan for continued computer literacy in-service training and recommendations for an undergraduate computer literacy

instructional program for the state's university based vocational teacher training schools.

Research Questions

For this study, six basic research questions were examined. The first research question was not answered directly by the data collected from the survey instrument. This question was addressed as a part of the literature review and design process for the survey questionnaire. The resolution of the first research question prior to the others was necessary in order to design the study survey instrument and questioning strategy essential for the data collection. Questions two through six were addressed by evaluating the data collected from the study survey instrument.

The research questions were:

1. What skill areas constitute computer literacy for a vocational teacher?
2. What computer skills do the vocational teachers possess, and at what levels do the teachers possess these skills?
3. How does the level of previous formal or informal education impact or relate to computer literacy levels?
4. Which specific content areas tend to provide or minimize computer literacy education for vocational instructors?
5. What demographic conditions impact vocational teacher computer literacy?
6. Where do computer literate teachers obtain their training?

Definition of Terms

The following definitions are provided to eliminate any confusion on the part of the reader and to provide a uniform operational definition of the specific terms. The first definition, computer literacy, is an operational definition presented by the Computer Instrument Design Committee. Several literature sources provided definitions (Grady and Poirot, 1983; Klassen and Anderson, 1983; Watt, 1983; and West, 1983), but these definitions were generally philosophical, with none indicating a definable level of performance. As this MARP was designed to deal with performance criteria and to treat data based on specific performance levels, an operational definition that is performance-based was established.

Computer Literacy Computer literacy is the ability of an individual to turn the computer on, turn it off, insert a disk, load a file, save data to a disk, close a file, turn the computer off, and word process with the computer. Computer literacy also includes the ability to operate advanced spreadsheet, database, or gradebook programs or the ability to write simple computer programs using common computer languages as a substitute to operating advanced programs.

Computer-Assisted Design (CAD) - Computer assisted design (or drafting) is the process of using the computer to accomplish engineering design and illustration. Commonly used in mechanical, electronic, or architectural design areas (Wood, 1982).

Computer-Assisted Instruction (CAI) - Computer assisted instruction is the process of conducting classroom skill drills and academic instruction using a computer as the instructional medium (Grady and Poirot, 1983).

Computer Managed Instruction (CMI) - Computer managed instruction is the process of using a computer as a classroom management tool for the purpose of maintaining student demographic information, progress records, test administration and documentation, and generating student progress reports (Dennis, 1983).

Desktop Publishing - Desktop publishing is the process of creating publications or documents using text, graphics, and artwork using the computer as the design and assembly medium (Galloway, 1984 and Vick, 1990).

Hypermedia - Hypermedia is a newly designed computer programming authoring language that uses simple direct English text as programming commands (Goodman, 1988).

Vocational/Technical Teacher - A vocational/technical teacher is a classroom teacher who instructs a subject or content area recognized by the State of Nevada as a vocational, technical, or occupational subject requiring state vocational certification and recognition as a vocational subject. Vocational certification and recognition does not include business subjects at the secondary or postsecondary levels and does not include health occupations at the postsecondary level.

Limitations

This study was limited to a sample population of vocational/technical teachers that did not include teachers of business, general business, or business machines. Although these subjects are occupationally applied, these subjects are not recognized by the state as vocational coursework, and are not certified as vocational subjects. As these content areas are not recognized by the state or local school districts as vocational programs at the secondary or postsecondary level they were not included in the study.

Also excluded from the study were health occupations at the postsecondary level. General Health Occupations as a content area is recognized by the state as a vocational subject at the secondary level. At the postsecondary level this content area is divided into several specific subject areas that are included under nationally certified organizations and are not state recognized or certified. Incorporated in these postsecondary programs are nursing programs, dental hygiene, and medical records. Instructors in these postsecondary content areas were not surveyed.

Assumptions

Three basic assumptions were made about the study. The first assumption was that the survey/interview instrument was a valid instrument although it had only a few questions for gathering data. The design method, field-test validation, and external validation

provided reasonable assumption that the instrument was valid and reliable for providing the information needed for this study.

The second assumption was that the two data gathering methods, mailed survey and personal interview were of equal validity in gathering data. The Computer Instrument Design Committee, impaneled to create the survey questionnaire, felt that the explanations on the survey instrument were complete and detailed enough that the mailed responses would be comparable to responses given to an interviewer.

The third assumption was that the sample population selection methodology provided a valid sample. Since the sample group was a whole population without any random sampling conventions, it was assumed that the number of actual sample responses would be sufficient for validity, and the data could be correctly inferred to be representative for the whole population. It was also reasonably assumed that as the sample population represented sixty-five percent of the total possible sample population of the state, the data could be inferred to be valid for the entire state as well as the sample geographical area.

Chapter 2

REVIEW OF LITERATURE

It is no exaggeration to say that most of the nation's college faculty is dysfunctionally computer illiterate; primarily, because the technology is significantly different from that of the traditional tools of the scholar and teacher-the pen, the pad, and the text (Durbak and Sadnytzky, 1984:7).

The single most common concern among computer researchers has been that teachers lack computer literacy skills. Resolving this problem has been one of the central faculty issues reported in recent academic literature. The review of literature dealing with teacher computer literacy issues generated four topic areas. The first area dealt with the characteristics of teacher computer literacy. The second topic covered the administrative role in computer literacy for teachers. Topic three was the affective domain solution strategies required for successful computer literacy instruction, and the fourth dealt with the cognitive solution strategies of successful teacher computer instructional programs.

Characteristics of Teacher Computer Literacy

Teacher computer literacy is determined or defined by specific competencies. Although the experts do not universally agree on all of the precise skills that absolutely define computer literacy, general skill levels are commonly accepted. Identifying the competencies has generally been determined by two different methodologies.

The first common method was to conduct skill, task, and job analysis, using a recognized analysis method like the DACUM (Develop

A CURriculum) model, or similar methodologies (Roth and Tesolowski, 1986 and Tesolowski and Roth, 1985). This procedure essentially consists of conducting an analysis seminar with experienced computer educators. The educators identify the specific individual skills and tasks that they feel are necessary to be computer literate (Norton, 1985).

The second common method has been to survey teachers to identify the specific skill areas that the local teacher group feels are necessary to know in order to successfully and effectively use computers in the classroom (Cloutier, 1985 and McKinney, 1984). After the skills are identified, institutions conduct workshops that address the identified needs (Dyrenfurth and Miller, 1984 and Kopke, 1984). Participant and program evaluations, with follow-up surveys on teacher attitudes and improved computer usage, are conducted for the purpose of determining the level of program success (Cole and Riser, 1987; Martin and Heller, 1982; and Helms, 1987). This method tends to be slower in identifying skills than the skill analysis method as it is more of a trial and error system. However, this method appears to tailor the instructional process directly to local needs (McKinney, 1984).

The educational computer experts agreed that computer literacy consisted of five general skill areas including hardware literacy, word processing, data-base/spreadsheet or computer managed instruction (CMI), computer assisted instruction (CAI), and computer programming. Each of these areas will be discussed separately.

Hardware Literacy

The psychomotor skill operation of computer machinery and hardware is referred to as hardware literacy (Anderson, 1985 and Helms, 1987). Among the skills necessary for computer literacy this skill is designated by most program designers as the first and most essential skill (Galloway, 1984; Helms, 1987; "Introduction to Vocations," Wayne Township, 1985; Kapp and Knickerbocker, 1983; Levin, 1983; Lindbeck, 1982; Merbler and Lawver, 1983; Stecher, 1984; and Walla and Wendel, 1983). Hardware literacy essentially consists of the ability to turn the computer on and off, insert and eject computer disks, open an application or file document, and save data on a disk. Advanced problem solving or computer applications can not take place until the novice can operate the basic mechanical functions of the machine (Anderson, 1985).

Word Processing

The second most common skill discussed in computer literature is word processing. Word processing is considered to be the most significant computer application skill that a teacher can learn (Cloutier, 1985; Cole and Riser, 1987; Dellow, 1985; Galloway, 1984; Grady and Poirot, 1983; Schwartz, 1985; and Stecher, 1984). The ability of a teacher to word process opens up several other educational computer applications.

Vocational faculty members at the postsecondary level are often expected to publish (Danielson, 1985). Computer word processing greatly simplifies the authoring and publishing processes for the

teacher, requiring less expended time than traditional hand or typewriting requires (Brown, 1983). Generating instructional materials is much simpler with computer word processing. Disk storage allows for simple and rapid changes and up-dates to instructional materials, reducing the hours of labor for the teacher and reducing the time necessary to modify the actual product that is to be delivered to students (Danielson, 1985 and Johnston, 1985).

With experience in computer word processing, a teacher can progress to more advanced word processing applications by creating course outlines, textbooks, and reference materials using desktop publishing techniques (Galloway, 1984 and Wedman and Strathe, 1984). This publishing methodology allows for more locally valid and specific instructional materials as well as a method for teachers to earn a greater share of textbook profits (Turner, 1989).

Spreadsheet/Database/Computer Managed Instruction

The use of the advanced applications programs, spreadsheet and database, are listed with computer managed instruction programs as they are all similar in application and learning procedures. These advanced applications programs are usually listed as the third most important computer skill area for teachers to learn (Cloutier, 1985; Dellow, 1985; Galloway, 1984; Helms, 1987; and Walla and Wendel, 1983). As a comprehensive study area, computer managed instruction generally incorporates programs that record student data and grades, maintains student progress data, generates data reports, and perform scheduling and budgeting functions

(Dennis, 1983; Spivak and Varden, 1983; Suppes, 1983; and West, 1983).

The new demands on education for accountability have generated large and excessive amounts of paperwork and record keeping. The computer as a management tool provides a method of making excessive record keeping manageable (Joiner, Miller, and Silverstein, 1983). Studies indicate that CMI programs manage student data better than traditional hand gradebook methods (Bracey, 1982 and Walla and Wendel, 1983), and budgeting and scheduling functions are far more manageable with CMI programs than hand-generating methods (Johnston, 1985). In both areas, data can be recorded, delivered to students, and transmitted to other locations faster and more reliably than hand-generated methods. The use of computer management systems greatly reduces the time that instructors must spend in data handling capacities (Danielson, 1985).

Although gradebook programs are available for most computer types, teachers will often use a spreadsheet program for the recording of grades as these two types of programs are almost identical in their methods of operation. Spreadsheet and database programs are generally used in similar functions to the gradebook programs even when not being used directly for student data handling. This similarity in function is why literacy program designers usually combine these program applications into one skill area and indicate them as the same skills.

One of the newly developing aspects of CMI is electronic mail (Petrosky, 1985). Electronic mail allows the teacher to have

immediate computer access to other computers within the same office, other offices within the school, other schools, and libraries throughout the country. Computer access to major libraries allows the teacher to obtain publications and books directly, greatly simplifying the research process. This ability is a strong motivation for some teachers in becoming computer literate (Galloway, 1984; Johnston, 1985; and Wedman and Strathe, 1984).

Computer Assisted Instruction

Computer assisted instruction is one of the major developing computer applications areas for all areas of education and vocational education specifically (Dennis, 1983; Grady and Poirot, 1983; and Schwartz, 1985). Modern applications of computers for classroom instruction (CAI) developed out of the teaching machine concepts developed by the learning theorist B.F. Skinner (Evans, 1968 and Green, 1984). Computer assisted instruction is very consistent with Skinner's theories as it provides the self-paced repetitive drill and practice tutoring that Skinner advocated for consistent skill reinforcement (Dennis, 1983; Hernandez-Logan, 1982; Suppes, 1983). Skinner, in an interview with a computer learning publication, stated:

When I go back and look at the (teaching) machines I invented, I can see that they were just efforts to do mechanically what can now be done much more smoothly with computers (Green, 1984:24).

Computer instruction has, as one of its strongest valid characteristics, the ability to progress at the students' pace, allowing for individualized instruction while never tiring of having to go back

through the same material several times (Ediger, 1982; Hernandez-Logan, 1982; Joiner, Miller, and Silverstein, 1983). Many CAI programs have testing capabilities and also record the individual student's progress (Spivak and Varden, 1983). This methodology is currently being advocated for gifted and special students who are progressing far faster or slower than average classroom rates of progress (Iwler and Ferrero, 1984 and Suppes, 1983). CAI appears to adapt well to students with different learning styles (Ediger, 1982).

Computer assisted instruction is currently in use in many elementary, secondary, and postsecondary schools throughout the country, particularly in math and English classes. Recent studies conducted regarding the success rates of CAI were meta-analyzed by Kulik and Kulik (1986) (1987), and the results indicated that CAI instruction demonstrated slightly better achievement results than traditional instructional methods covering the same material. These encouraging results have motivated more school administrations to attempt development and implementation of CAI programs in their schools (Duttweiler, 1983). College programs that are very content intensive requiring national board exams, such as nursing, are major advocates for CAI in providing drill for national exams (Irvine, 1983).

Computer Programming

The basic literacy skills listed in this study are universally agreed upon by most computer education experts. The one computer skill group that does not have universal agreement is computer programming. Among computer educators the experts are

sharply divided with approximately half of the experts believing that computer programming is essential in learning computer literacy (Denenberg, 1980; Frenzel, 1981; Grimes, 1981; Leuhraman, 1983; and Young, 1985). Other experts feel that programming is unnecessary for literacy and that requiring individuals to learn programming as a part of the requirements for literacy increases anxiety and reduces voluntary participation (Dunn, 1985; Dyrenfurth and Miller, 1984; Gress, 1981; Helms, 1987; Jalbert, 1986; Jay, 1981; Morsund, 1981; Pantiel and Peterson, 1985; and Wright and McNair, 1984).

Most of the educators who support programming requirements in literacy training generally are those who were originally taught literacy from computer science departments and brought their computer skills into the educational environment. These individuals generally believe that a teacher can not understand the logic and function of a computer unless the teacher can write computer programs (Hooper and Mandell, 1984 and Mustafa, 1987). This posture is widely accepted and used as the design basis for most of the computer literacy workshops conducted nation-wide in the last five years (Merbler and Lawver, 1983, and Young, 1985).

Computer educators who oppose programming as a requirement for computer literacy relate Molnar's (1983) analogy where he stated that a person does not need to know how the internal combustion engine works to drive a car. Similarly, a person does not need to understand the inner workings of a computer to operate it. Molnar further suggested that for a teacher to use the

computer effectively, it was more important to understand learning theory than to understand computer theory.

Although many of the experts believe that literacy for a vocational teacher does not necessarily include computer programming skills, some computer researchers believe that eventually computer users who are not programmers will want to be able to interact with computer applications and information bases (Dunn, 1985; Cates, 1987; and Merbler and Lawver, 1983). The ability to interact is limited, however, by the absence of sophisticated programming skills (Sculley, 1988). The vocational teachers' major concern has been that there has not been a suitable computer language, which is quick and easy for the teacher to learn and functions in a natural user-friendly way (Dean, 1982).

A recent development in the computer field promises to provide a new avenue for authoring or customizing software and providing access to information bases through CD-ROM technology (Brown, 1988). The new simplified interacting methodology is called hypermedia. In the IBM computer experts refer to the hypermedia language as hypertext while Apple computer software developers use the trademark name HyperCard (Goodman, 1988). Hypermedia allows the individual to create limited instructional and interactive software using standard English keyboard commands. The hypermedia authoring method also allows the individual to add information to standardized instructional and informational databases, without having to write computer programming to execute access (HyperCard User's Guide, 1989). This new computer

language/medium can potentially solve the vocational teachers' difficulty of ready access to an authoring computer language.

The Governance Role in Computer Literacy

Solution strategies are integral parts of the governance domain as well as the instructional domain. Computer literacy instruction for teachers can not be implemented until school administrations are convinced of the need for teacher computer literacy and will support instructional goals (Martin and Heller, 1982; Duttweiler, 1983; and Pantiel and Peterson, 1985). Historically, teachers have made it clear that they will not adopt new methodology or technology without active administrative support (Sturdivant, 1985). Training all of the secondary and postsecondary academic and vocational educators to be computer literate will be a major undertaking requiring a significant expenditure of fiscal and human resources, requiring substantial administrative commitment (Danielson, 1985).

Administration's role in teacher computer literacy is from a different perspective than the classroom teacher's role. Public and political demands for the computer education of public school students compel school administrations to buy equipment and supplies and to offer coursework whether it is an institution's objective or not (Jalbert, 1986 and Wright and McNair, 1984). In response to public demands, many colleges have recently set goals for total student computer literacy (Hadley and Farland, 1985). This rapid influx of hardware and software into the school environment to meet these goals, has caught most vocational educators unprepared

to utilize the new technology (Hadley and Farland, 1985 and Tesolowski and Roth, 1985). With political and parental pressures to implement computer technologies immediately, the school administrations will have to avoid being "dazzled" by the technology and pressure and become a buffer between the community and the faculty during the interval that it takes to train faculty to be computer literate (DeLoughry, 1989 and Pantiel and Peterson, 1985).

The area in which vocational teachers are most unprepared for computer usage is in personal computing skills (Roth and Tesolowski, 1986). The scope of need for computer literacy training is rather large as most teachers currently practicing received their teacher training prior to 1980, before computer training was available (Helms, 1987 and Merbler and Lawver, 1983). Prior to 1980, computers were generally only readily available to large research universities with major research commitments dominating the majority of the computer resources, with student access and instruction limited (Hooper and Mandell, 1984). Postsecondary administrations will have to accept responsibility for this major educational undertaking by committing significant financial and manpower resources to solve this immediate and pressing problem (Wright and McNair, 1984).

Insuring computer literacy within a specific institution, district, or system requires governance bodies to develop a master plan (Hadley and Farland, 1985; Roth and Tesolowski, 1986; and Sturdivant, 1985). Careful planning is even more critical for vocational education than academic education as instructional computer material development for vocational education has lagged

behind development of academic subject materials (Passmore, 1983). A master plan model that allows the institution to audit its current status, develop preferred scenarios, and is well suited for computer issue solutions is the strategic planning model (Brosnan, 1983 and Groff, 1984). Strategic planning and management allows schools to make effective computer instructional decisions from within a framework of choice and preferred scenario rather than making decisions as a reaction to local personalities, whim, or commercial marketing strategies that may or may not benefit the school (Brosnan, 1983).

Educational administrations can foster teacher computer literacy education by funding computer hardware, software, and resource centers (Martin and Heller, 1982 and Merbler and Lawver, 1983). Although financial expenditures for computer equipment and materials is crucial for literacy instructional success, financial support is not enough. Governance organizations must commit human resources (Stevens, 1984). Money that is spent on improving teachers' computer abilities is better spent than money spent on hardware (Austin, 1988; Danielson, 1985; and Sturdivant, 1985). Effective programs require paid in-service days for instructors as incentives for attendance and tuition re-imbursal for college coursework in computer studies (Pantiel and Peterson, 1985). The largest single commitment by educational leadership to teacher computer literacy must be in the form of on-going in-service training (Hadley and Farland, 1985). Insuring that all vocational teachers are trained in computer usage will take several years of continued

resource commitment on the part of school administrations at all levels (Danielson, 1985).

Affective Issues and Strategies of Successful Programs

Successful solution strategies must address the affective as well as the cognitive needs of teachers in the literacy training process (Farris, 1983; Irvine, 1983; Kopke, 1984; Waldrop and Adams, 1988; and Wedman and Strathe, 1984). An educational researcher clearly defined the plight of teachers in relationship to the problems of computer literacy, when he stated:

Putting computers into classrooms represents an enormous risk to teachers and makes incredible demands on educators and our capacity for change and our understanding of a teacher's role.... Change generates fear: fear of displacement and domination, of knowing less than the student, of loss of control over the learning experience, of equipment failure, paperwork, and the breaking of the machine (Mathieson, 1982:14).

Computer researcher Cicchelli (1984) indicated that the computer literacy needs of the teacher were "personal," or individual affective needs, while the administration's needs were "system," needs, the needs of the institution and society in general. Both types of needs must be effectively addressed for any literacy training program to have long-term success (Wedman and Strathe, 1984).

The solution strategies dealing with affective needs must begin with a process of overcoming adult and faculty resistance to and apprehension about using computers. A new term has been recently proposed to define adult apprehension to computer usage. This term, "computer anxiety," is considered similar to "math anxiety" (Issa, 1989 and Spero, 1982). Another common term attributed to

anxiety related to computer technology is "technophobia." Researchers surveying college faculty and students stated that campus survey responses indicated that faculty were substantially more "computer phobic" than students (Brown, 1983 and Issa, 1989).

Faculty members tend to resist computer usage as they feel threatened by new non-traditional technology. In many cases, teachers feel threatened that young children who are receiving computer instruction in elementary school are actually intellectually more advanced because they are developing advanced skills at such a young age (Jalbert, 1986). Skinner (1986) addressed the problems with computer resistance when he discussed the teachers' concerns about the potential threat of massive changes in the educational delivery system.

Teachers have accurately perceived that education will be changed by the computer and they fear that their roles and jobs are in jeopardy (Skinner, 1986 and Waldrop and Adams, 1988). Additionally, teachers are becoming more concerned about how computer skills will be used in performance evaluations. Many schools currently use computer skills as part of the evaluation criteria for tenure and promotion, and most that do not now use this as a part of the criteria, will probably do so soon (Brown, 1983 and McCord, 1984).

One of administration's most difficult issues related to computers is also one of the teachers' greatest issues. The need to rapidly implement computer training, for students and faculty, has caused administrations to make almost all decisions from the top

down with little or no shared decision-making with the faculty (Jalbert, 1986). Teachers must be involved as a share-governance responsibility in helping shape a school's computer policies or the teachers will feel that they are being forced to accept this technology without a choice (Winans, 1985).

Part of the resistance to computer technology from both secondary and postsecondary teachers is related to the programming controversy. Some researchers feel that faculties will oppose literacy training if they must learn to be computer programmers (Dellow, 1985; Jalbert, 1986; and Durbak and Sadnytzky, 1984).

Administrators of liberal arts and vocational faculty have particular difficulty in getting literacy training cooperation as these faculty members resist computer programming training as non-applicable to their content instructional areas (Anderson, 1985 and Stecher and Solorzano, 1987).

Several potential solutions have been recommended for overcoming "computer anxiety." A systematic approach to applying the solution strategies will greatly improve the potential for program success (Wedman and Strathe, 1984). Teachers must be made aware that computer technology, once adopted, will increase the teachers' productivity while reducing mindless routine (Danielson, 1985 and Johnston, 1985). Additionally, teachers will become less resistant to the technology if they are shown the flexible and creative opportunities for problem solving that the computer provides (Dellow, 1985 and Martin and Heller, 1982).

An important first step in the educational process is to provide educators with a non-threatening environment where the computer's

educational potential is demonstrated (Turner, 1988). Killian (1984:1) stated: "A conducive environment plays a major role in encouraging teachers to update technological skills." As a part of the environmental concerns, almost all successful programs indicated that the teacher/participant needed to have his own computer to work on (Lindbeck, 1982; Walla and Wendel, 1983; and Winans, 1985). A maximum of two people to a machine is recommended (Irvine, 1983).

With a need for computer training established in the minds of teachers, the next step is to provide a cooperative non-threatening instructional program (Cole and Riser, 1987). Teachers need to be taught how to use the computer in an adult-centered instructional environment to minimize anxiety (Wedman and Strathe, 1984). The instructional program will have more success if the participants are provided the opportunity to interact in a group setting with their peers. This interaction provides peer support and the awareness that the lack of computer skills is not limited to only one instructor (Irvine, 1983 and Stecher, 1984). Many programs currently being offered are centered around course content and fail to take into account the instructional needs of adults. Purely content centered programs rarely succeed (Wedman and Strathe, 1984).

The instructional staff should not be computer experts from industry (Kopke, 1984), and young "whiz-kid" computer experts should not be used as instructional staff (Irvine, 1983). The ideal instructional staff should be peers and colleagues of the participants. Some workshop program supervisors even suggest same-sex approximate age tutors as the ideal situation (Van Gelder, 1983).

Researchers recommend one-on-one tutoring if possible (Wedman and Strathe, 1984). If resources do not permit a tutorial system, the classes should be as small as possible with no more than two or three students per instructor (Stecher and Solorzano, 1987).

As a part of the instructional program, the teachers must be provided ample time and opportunity to practice their new skills until self-confidence is developed ("How Educators Use Microcomputers," 1982). An important component of the teacher training process for teachers should include ready access to computers during and after instruction (Helms, 1987). Almost all organizations that operated workshops stressed the importance of hands-on training and experience (Irvine, 1983; Kapp and Knickerbocker, 1983; and Stecher and Solorzano, 1987). Providing computer labs dedicated exclusively to faculty instruction and practice greatly increases the success rate of a faculty training program (Kopke, 1984). In addition to providing computer labs for teacher instruction, computers should be made available for teachers to take home wherever financially feasible (Austin, 1988; Helms, 1987; Cates, 1987; and Spero, 1982).

A final concern that some researchers expressed was the concern that any computer instruction at any level must include the discussion of ethics and values (Brown, 1985; Levin, 1986; and Passmore, 1983). The experts universally agree that teaching a technology as far reaching and as impacting on society as computer technology must be addressed in relationship to its societal impact (Naisbitt, 1984 and Slaght, 1988).

It is particularly important for the faculty who are training tomorrow's vocational/ technical teachers to have a thorough understanding of computer technology. This understanding reduces bewilderment about computers as well as promotes a balanced view of the computer's role in society (Klassen and Anderson, 1983).

Cognitive Strategies of Successful Programs

Organizations that have conducted successful computer literacy programs for teachers have identified that cognitive strategies are centered around program origination, program organization, and content organization. The first cognitive elements deal with the original start-up of the program. Program origination and implementation have some inherent problems that must be addressed before the first classes can be held or long-term policy can be developed.

Colleges feel pressured to start computer programs that they often can't afford. Hardware and software must be purchased and available before any instruction is even suggested, let alone implemented (McKinney, 1984). In spite of the fact that schools lack funds or expertise, they must design and operate their own programs. If the schools will not offer computer training, industry will, and because industry computer experts are rarely educators, they will scare off teachers (Pantiel and Peterson, 1985 and Stecher, 1984). The design of the computer literacy training must be from the bottom up if the faculty is to feel that they are a part of the process and that computer literacy is in their best interests (Jalbert,

1986; Stecher, 1984; and Winans, 1985). An effective method for faculty decision participation is a college level computer committee (Levin, 1983).

The faculty will provide the talent to make a successful computer literacy program run. The first trained computer experts on campus often have to be taught by industry (Stecher, 1984), but these first trained people should become the facilitators and consultants that train the cadre of instructors for additional faculty training (Carlson and Berger, 1988 and Sturdivant, 1985). It would be helpful to designate a computer resource person for each campus to improve program success rates (Kapp and Knickerbocker, 1983; Levin, 1983; and Martin and Heller, 1982). These people should be the most highly trained "power users" in the institution (Austin, 1988). The core of trainers for the faculty workshop participants should be peers and teachers, not computer professionals (Austin, 1988; Kopke, 1984; and Pantiel and Peterson, 1985)).

Program organization begins with the design of the delivery system. The best delivery system method for in-service of teachers appears to be a workshop or seminar format (Levin, 1983 and Schwartz, 1985). Teachers prefer an instructional format that provides quick and direct instruction without having to be involved over long periods of time (Carlson and Berger, 1988 and Dunn, 1985). The workshop format is ideal for familiarization, basic literacy training, and specialized training on a single piece of equipment or software package. Intensive complex instruction on difficult software programs or programming languages requires that

teachers take traditional semester-long courses (Pantiel and Peterson, 1985).

Many researchers agree that computer literacy instruction needs to be presented in two or three components (Carlson and Berger, 1988; Dunn, 1985; Goettmann, 1984; Irvine, 1983; and Walla and Wendel, 1983). The first component must deal with basic original literacy instruction (Cloutier, 1985 and Cole and Riser, 1987). This instruction approximates similar types of instruction that would take place for basic language and math literacy skills in elementary school, or remedial programs in secondary or post-secondary schools (Dunn, 1985 and Kopke, 1984). Before this instructional component is implemented, the prospective participants should be evaluated to determine their specific skill levels. Assessment also allows for the targeting of instructed competencies (Dukes, 1986). The basic skill instruction is fundamental to any additional or advanced computer skills instruction (Dellow, 1985). The skills identified for this first instructional component are those that are listed as minimum computer literacy skills at the beginning of this literature review.

The second component consists of advanced generalized instruction (Carlson and Berger, 1988; Cloutier, 1985; and Cole and Riser, 1987). This component would customarily include instruction in specific institution-wide CMI programs, specialized CAI programs and software development using programming languages or hypermedia (Pourciau, 1984). The specific workshops offered in this phase would normally be custom designed to meet the specific needs of the institution, while the first phase would deliver information

generic to any school environment (Anderson, 1985; Cloutier, 1985; and Dunn, 1985).

A third component of literacy instruction, if the institution optioned to offer this phase, would consist of advanced content area and industry specific instruction (Stecher and Solorzano, 1987 and Walla and Wendel, 1983). This type of instruction might include computer hardware and applications software programs that are industry specific (Anderson, 1985). An example of this would be the difference in computer applications for a nurse or health-care professional and the computer applications for a machinist using computer assisted manufacturing techniques (Cloutier, 1985). Additional advanced instruction might include the teaching of specialized programming skills or the usage of advanced engineering or design computer programs (Goettmann, 1984).

Content organization is the backbone of a successful program. The determination of what competencies to instruct may be determined from the task analysis model (Tesolowski and Roth, 1985 and Roth and Tesolowski, 1986) or from target participant assessment models (Levin, 1983 and McKinney, 1984). Regardless of the method of determining competencies, the skills selected should be organized in a systematic format providing a method for design, field testing, presentation, evaluation, and revision (Gagné, Briggs, and Wager, 1988).

In the basic workshop format, a few design elements will improve the potential of program success. Workshops should be designed with more than minimal amounts of hardware and site licensing for ready access to software (Anderson, 1985). Large

screen projectors for improved visibility should be a standard classroom medium (Bowman and Ellsworth, 1982). Teacher distractions should be limited during the workshop period by reducing outside responsibilities (Young, 1985). Providing credit for study, paid tuition, or paid summer wages for attending will greatly increase enthusiastic involvement (Levin, 1986, and Pantiel and Peterson, 1985).

Literature from commercial and educational sources should be distributed, with commercial vender demonstrations made available if possible (Irvine, 1983). For teaching teachers in a workshop format, handouts on basic computer functions are preferable to using textbooks. Handouts require less time for teachers to use and save the school money (Stecher, 1984). The final element in a successful faculty workshop is evaluation and follow-up. A mechanism must be implemented to evaluate the participants progress and later follow-up to determine if the newly-trained teacher has made significant improvements in educational computer usage (Cole and Riser, 1987 and Martin and Heller, 1982).

Alan Kay, one of the pioneers of current user-friendly computer technology, proposes that the greatest potential for a teacher to open the doors of knowledge at all levels, for himself and for the student, is to learn to use the computer as a tool to extend human capabilities and tap previously unreachable knowledge sources (Rogers, 1989). For the vocational/technical teacher to be able accomplish this significant and potentially far-reaching goal, viable computer training programs must be developed.

Summary of the Literature Review

Modern computer technology is a reality that will not go away. Education's most important objective is to develop a methodology by which man can live and work in harmony with the computer and its technologies. To be long-term effective, it must be a harmonious marriage and not a hostile compromise (Naisbitt, 1984 and Slaght, 1988).

The researchers have isolated the elements necessary to make the harmonious transition into the computer age. The first element is competency. The specific competencies that teachers need are hardware literacy, word processing, spreadsheet/database/CMI, computer assisted instruction, and programming. Several organizations have organized and conducted successful workshops instructing the identified competencies. As part of the design and implementation procedures, the researchers have determined that governance has a significant interest in the success of computer literacy training, and governance shares equally with instruction in the need for successful teacher computer education.

Successful computer literacy training must address the affective and cognitive needs of teachers. Special consideration must be given to reducing teacher resistance to computers. Using affective solution strategies will greatly increase the success potential of any program implemented. Cognitive elements are essentially the process of successfully organizing the original implementation

procedures, course content, and program design. Presently, there are several programs being successfully operated nationwide, but most were designed with local needs in mind and were designed by trial and error methodology. This trend emphasizes the need to implement programs that are locally viable.

John Naisbitt (1984) stressed the need to offset the harsh mechanical realities of modern technology by implementing more people-oriented programs that soften the impact of humanity making contact with cold technology. Implementing "High Touch" efforts to offset "High Tech" conditions will allow a conservative educational institution to enter the computer age with a feeling of belonging and not alienation.

Chapter 3

PROCEDURES AND METHODOLOGY

Procedure

The research procedure selected for this study was a combination of elements. The first research element consisted of a literature review which provided not only useful information from other similar projects for research methodology, but it also presented solution strategy options for the implementation of program or procedural changes based on study data.

The second element consisted of a descriptive survey. A questionnaire was developed to be administered as a survey instrument through the mail for the purpose of gathering specific information from several individual cases. Best (1977) indicated that this method is preferable when the researcher is concerned about gathering generalized statistics that can result when data are abstracted from a number of individual cases. The survey instrument was designed with one specific open-ended question and a questioning strategy that allowed the sample individuals some opportunity to elaborate or expand on information requested. Yin (1984) indicated that open-ended questions may allow the investigator to obtain more specific clarification of information than can be achieved through only "yes" or "no" responses. Significant issues that can be cloaked by the forced-choice questionnaire can be illuminated by "why" questions and open-response data gathering

strategies (Kintzer, 1977). The survey instrument was administered through the mail to the thirty-seven vocational teachers assigned to academic high schools and the six vocational teachers employed in the rural county areas.

The third element of the study procedure consisted of interviewing the study sample individuals who are assigned as teachers within the metropolitan area four vocational instructional centers. The interview procedure was conducted as the data gathering method for obtaining data from the sample individuals who are employed within the boundaries of the metropolitan city area. An educational researcher discussed the importance of this method when he stated:

A survey conducted by interview takes much longer to complete than a comparable questionnaire survey, but the respondents tend to comply, usually assuring a one-hundred percent response rate (Orlich, 1978:9).

The questionnaire was designed to be mailed to sample individuals geographically difficult to reach and also to be used as the interview survey instrument. Using the same document for both procedures kept the questions and responses consistently focused for both methods of administration. In the interview process particular attention was directed toward the open-ended question dealing with additional non-listed computer skills. The open-ended question used in the interview process provided for information gathering similar to traditional case-study methodologies documented by case-study researchers (Yin, 1981).

The Computer Usage Survey Questionnaire developed for this study and a cover-letter explaining the purpose of the study was

mailed directly to the thirty-seven vocational/technical teachers assigned in academic high schools and the six vocational/technical teachers that teach outside of the Las Vegas, Nevada metropolitan area (Appendix A). One month from the date the questionnaires were mailed, a follow-up questionnaire and cover-letter were sent to the teachers that did not respond to the original questionnaire. The total number of responses from the mailed sample was thirty-seven.

The vocational/technical teachers at the four central vocational training facilities within the county were interviewed in person. The Computer Usage Survey Questionnaire provided the specific questions for the interview. Responses were recorded on the questionnaire in the same manner as if the questionnaire were sent to the sample individuals. The close proximity of the four major vocational facilities made the personal interview process a reasonable method of determining responses with the potential for a higher percentage of responding individuals. The total number of responses from the interview process was seventy-eight, for a total sample response of 115.

The Sample

The sample group for the study was a whole population. Many researchers (Best, 1977 and Isaac and Michael, 1987) feel that for most studies a whole population is usually unmanageable because of size. Using the whole population was, however, a manageable procedure for this study. The total group was relatively small, approximately 121 total individuals. In Krejcie and Morgan's (1970)

table on "Determining Needed Size of a Randomly Chosen Sample," the random sample necessary for reliable inferences about a whole population of 121 is ninety-three. As it was reasonable to assume that not all of the mailed questionnaires would be returned and some of the sample members designated to be interviewed would decline to be interviewed, the final sample number approximated the preferred reliable random sample number. As three-fourths of the sample population was located in four facilities in close approximation, gaining access to the whole population was a reasonable and manageable task.

The sample for this study included all full-time secondary and postsecondary vocational/technical teachers in Clark County, Nevada. This sample population which came from the Clark County Public School District and the only postsecondary vocational/technical training institution in the southern half of the state, the Clark County Community College, included sixty-five percent of the total number of vocational/technical teachers in the state of Nevada (Occupational Education Master Plan, 1989). Additionally, all adjunct faculty at the Clark County Community College who taught an adjunct full-load, which is two classes per semester, were surveyed as well. The total sample population consisted of eighty-one secondary vocational teachers and forty postsecondary vocational teachers.

The sample secondary vocational teachers were primarily assigned in two vocational/technical centers in Clark County, the Area Trade and Technical Center and the Southern Nevada Vocational Technical Center. Additionally, thirty-seven vocational teachers were employed in traditional academic high schools in the

Las Vegas, Nevada metropolitan area, and six vocational/technical teachers were assigned in out-lying rural communities at a distance of sixty or more miles away from the City of Las Vegas. The Clark County Community College vocational teachers were located within two of the four major campuses of the college. These vocational/technical teachers were assigned at the Cheyenne Campus in North Las Vegas, Nevada and the Henderson Campus in Henderson, Nevada. Both of these campuses are within the boundaries of the Las Vegas, Nevada metropolitan area. The remaining two community college campuses are specialty campuses that do not offer vocational/technical courses.

The technical content areas of the secondary teachers that were surveyed included agriculture, automotive body repair, automotive engine repair, aviation air-frame and power-plant repair, construction trades, cosmetology, culinary arts, diesel mechanics, drafting, electronics, graphic arts, health careers, marine engine repair, ornamental horticulture, photography, refrigeration and air-conditioning repair, telecommunications, and welding. Diesel mechanics and agriculture each had one teacher in Clark County, but neither responded to the survey instrument and are not represented in the results section. The content areas of the postsecondary vocational/technical teachers surveyed were automotive engine repair, drafting, electronics, fire science, graphic arts, mechanical technology (industrial mechanic), law enforcement, marine engine repair, ornamental horticulture, photography, refrigeration and air-conditioning, and welding.

The Instrument

The survey questionnaire was developed by a Computer Instrument Design Committee organized specifically for the purpose of developing a survey instrument. The committee consisted of Dana Roberson, department chairperson of the computer science department, Michael Meagher, instructor in the computer graphics program in the Industrial and Services Technologies Division of the college, and the researcher. The members of the committee were specifically selected for their extensive and varied computer experience related to technical instruction and industrial applications.

The first step in developing the instrument was to review the literature to determine if similar documents already exist and to review information from similar studies. The literature search provided some sample survey documents (Austin, 1988; Cloutier, 1985; Ingram and Lowe, 1985; "Introduction to Vocations High Tech," 1985; Issa, 1989; Kapp and Knickerbocker, 1983; and Lockheed, 1983) but no examples of similar studies or questionnaires suitable to be adopted or modified. Most researchers were concerned with computer usage attitudes rather than determining existing skill levels. Several researchers (Bigham, 1987; Cole and Riser, 1987; Dukes, 1986; Grady and Poirot, 1983; Lacina, 1984; Lindbeck, 1982; Merbler and Lawver, 1983; Rossberg and Bitter, 1988; Roth and Tesolowski, 1986; Schwartz, 1985; Stecher, 1984) provided lists of competencies that computer literate

teachers should possess. Using the competency lists as a basis for determining specific competencies to be surveyed, the Instrument Design Committee selected the competencies that they felt constituted computer literacy for a vocational/technical teacher. Each competency was worded as a specific question for the survey instrument.

After the completion of the question list, the committee continued to review the model adding, removing, or modifying the specific questions until a final draft version was completed and approved by all members. It was determined by the design committee to include a question about one competency area that exceeds the operational definition of computer literacy for a vocational teacher. That question was focused on the ability of the sample individual to write simple computer programs. Although a vocational teacher generally would not be a programmer, the committee members felt that a sample respondent who could write computer programs making a "no" response to lower computer skill questions would appear to lack computer literacy that he did actually possess. Some individuals choose to bypass the normal computer program applications and as a primary computer function write computer programs. Programming skills clearly indicate computer literacy while this particular type of individual would appear not to be computer literate within the normal questioning strategy of the survey.

An additional area of potential confusion was identified after the survey was implemented. During the interview process while responding to the open-ended question, several individuals indicated

that although they did not operate the specific advanced application programs listed and did not write computer programs, they could operate computer assisted design or drafting programs (CAD). This new information was obtained under conditions similar to potential situations discussed by Kintzer (1977) about valid issues being obscured if they are not specifically covered in the forced-response questioning strategy.

As this particular competency was not addressed by the design committee during the original design phase, the committee recognized that the issue had to be resolved to designate a literacy or non-literacy determination for these sample individuals. The committee reviewed this competency area and determined that CAD operation did indicate literacy. Therefore, the individuals who responded that they could operate CAD programs were determined to be computer literate.

The title and wording of the survey was of significant concern to the design committee members. As the term "literacy" is an emotionally sensitive term, it was decided not to use that specific word on the questionnaire. It was felt that the individuals responding to the survey might be emotionally intimidated by the term and tend to claim competency skills above their actual ability levels in order not to be identified or labeled as "non-literate." As a result of this concern, the survey instrument was titled the Computer Usage Survey Questionnaire.

The final design version of the survey instrument was administered to three vocational/technical teachers at the post-secondary level for field-test validation. The testers were observed

during administration to determine if they were confused about any of the survey questions or administration directions. Modifications based on this procedure were conducted on the instrument.

The final draft version of the survey instrument was submitted to four computer education and vocational education specialists outside of the institution for objective validation. The validators were: Dr. Muin Mustafa, computer science instructor, University of Nevada, Las Vegas; Dr. Al Mizell, Instructional Technologist, Nova University, Fort Lauderdale; Dr. Albert Pautler, Professor of Vocational Education, University of New York, at Buffalo; and Dr. Warren H. Groff, Lecturer of Vocational, Technical, and Occupational Education, Nova University. The final draft version of the survey instrument can be found in Appendix A.

An area of potential confusion with the instrument was identified after the survey instruments had been completed and returned. Several respondents indicated that although they did not operate the specific advanced application programs listed and did not write computer programs, they could operate computer assisted design or drafting programs (CAD). This particular competency was not addressed by the design committee or included as one of the advanced applications programs in the instrument during the original design phase. However, the committee recognized that the issue had to be resolved to designate a literacy or non-literacy determination for these sample individuals. The committee reviewed this competency area and determined that CAD operation did indicate literacy. Therefore, the individuals who could operate CAD programs were determined to be computer literate.

Treatment of Data

Treatment of the data was conducted in two phases. The first phase dealt with one group of data not derived from the survey instrument but collected from the literature review and as part of the preliminary design process in the development of the survey instrument. These data were collected to answer the research question about what skills constitute computer literacy. It was essential that this data treatment be conducted and completed before the survey questionnaire could be constructed.

The second phase of data treatment was conducted using the survey/interview questionnaire for information collection. Treatment of this study data was divided into two major categories. The first category consisted of information related to specific computer skills. These data established two major sets of facts, computer literacy or non-literacy and the placement of each individual on the five levels of skill.

Computer literacy was determined by the responses to the first four items on the survey instrument since these questions deal with specific computer skills. The skills questions were divided into two potential data responses. Numbers one and two dealt with skills that are considered foundation skills, the mastery of which is not considered computer literacy. Therefore, affirmative answers to none of the questions or only numbers one and two indicated non-literacy. Number three and number four reflected skills that are

considered minimal computer literacy skills. Affirmative answers to questions three and/or four indicated computer literacy in this study.

The first four numbered response areas on the instrument reflected four levels of computer literacy skill, or if there were no affirmative responses to any of these four questions, a fifth skill level, which is no skill of any kind, was indicated. The first four response areas were presented in an ascending order from lowest to highest level. Although competence at skill components three and four indicated minimal literacy, competency at any of the skill levels reflected by the questions provided information as to what level of competence or understanding that the respondent possessed at the time of the study. Affirmative responses to only the first two questions also indicated that the sample individual was in the process of self-training or structured instruction, but that the levels of competence did not yet indicate literacy.

This second group of data in the skills level category placed each respondent in one of five categories that reflected his place at one of the five levels of computer skill or non-skill. The five categories determined by the study were (1) no skills-not literate; (2) hardware operation only-not literate; (3) word processing-not literate; (4) advanced applications user-literate; and (5) program writer-literate. The specific numbers and percentages of vocational/technical teachers that are computer literate and are not computer literate and their placement in the five categories was determined from the data received from the interviews and mailed survey responses to the survey/interview instrument.

The second general category of data consisted of information that potentially impacts computer literacy or defines the characteristics of a computer literate or non-literate vocational teacher. The information gathering areas of this portion of the study were first demographics, or information dealing with age and gender. The second data area of impacting factors was education. The third potential impacting factor was content or subject area taught and the level at which the vocational teacher instructed.

Data about age and/or gender as it reflects computer literacy or non-literacy was reported. Age particularly was considered by local computer science faculty to be an important determiner as to whether vocational teachers use computers in the classroom or participate in computer training. This speculation was local opinion without statistics to confirm or deny the hypothesis. During the survey instrument design phase of the study, design committee members determined that they did not believe that gender would be an impacting variable in computer literacy. However, the potential that this data might reflect a significance provided the reasoning for soliciting the information.

Educational information was solicited about two educational factors, general professional education and computer skills training. The origin of professional educational training might have been an impacting factor as it might indicate the most common sources of pre-teaching computer instruction. Factors regarding the origin of specific computer skills training might also help identify sources of computer training- pre-teaching or concurrently. Additionally, information was gathered to determine whether computer training

took place before teaching or during teaching. It was hoped that this information might provide insight into the extent and availability of professional education computer skills training.

The content area of the respondents was documented as vocational/technical teachers' content or subject area might indicate that certain content areas tend to provide more computer training than other content areas. Some researchers currently believe that more wide-spread adoption of computer technology is taking place at the secondary level than at the postsecondary level (Naisbitt, 1984). If this hypothesis is correct, it could impact the design and market targeting of the computer literacy in-service program.

An explanation of the research methodology has been presented in this section of the MARP. The following chapter will report the results of the study, and the final chapter will deal with interpretations, conclusions, and recommendations related to the results.

Chapter 4

PRESENTATION OF RESULTS

Computer Literacy Skills

The results of this study were recorded under two different categories of data. The first category was information obtained to answer the first research question. This question addressed identifying the specific skills that constitute computer literacy for the vocational teacher. The literature review provided the information to answer this first research question. The first question had to be addressed in order to develop the survey instrument necessary for the collection of data for the remainder of the research questions.

Several researchers in the literature review (Bigham, 1987; Cole and Riser, 1987; Dukes, 1986; Grady and Poirot, 1983; Lacina, 1984; Lindbeck, 1982; Merbler and Lawver, 1983; Rossberg and Bitter, 1988; Roth and Tesolowski, 1986; Schwartz, 1985; Stecher, 1984) provided lists of competencies that computer literate teachers should possess. The order of importance varied from researcher to researcher but the skill areas were mutually agreed upon. The skills that were universally agreed upon were hardware literacy, word processing, and computer managed instruction programs such as spreadsheet, database, and gradebook programs.

As these three skills were clearly identified in the research process, they were grouped as the core skills and used as the competency-based definition of computer literacy. These skills were additionally listed as skill questions in the survey instrument for determining computer literacy. The basic core skills were also designated as the core instructional skills units for the proposed in-service program. A fourth skill area was occasionally listed, and although the literature sources did not disagree on the merits of the skill area, many felt it was above the basic literacy level. This skill area, computer-assisted instruction, was not included in the core skills but would be included as an advanced general skill in later follow-up workshop formats.

A fifth skill area often identified but an area of major disagreement among experts was computer programming skills. As the experts were evenly divided in opinion, it was determined that the requirement of computer programming skills for a literacy training program should be a local decision. As part of the skill identification process for the survey instrument design and the in-service program design, it was determined that computer programming skills would not be included in the definition for computer literacy nor would the skills be taught in the basic computer literacy in-service program.

The second category of information was obtained from the survey instrument created from the first grouping. The second category addressed the remainder of the research questions. In order to collect data related to the four remaining research questions, a survey questionnaire was administered to all of the

vocational/technical teachers in Southern Nevada. The instrument was administered by mail and by personal interview.

Of the sample members that were mailed a questionnaire, thirty-seven out of forty-three responded, for a response rate of eighty-six percent. The sample population to be personally interviewed was a total population number of seventy-eight. Of this number, all seventy-eight were interviewed for a total response of 100 percent. The total response rate for both data gather systems was ninety-five percent. In Krejcie and Johnson's Table of Random Sample Numbers, the random sample number for a whole population of 121 is ninety-three. The total responses in the study, 115, exceeded the minimum response rate needed for a valid sample number.

Literacy or Non-Literacy

The survey instrument generated five areas of data response. The first area was the determination of literacy or non-literacy, for secondary and postsecondary levels, as a total group, and by content area. This information addressed the second research question dealing with the question of literacy, non-literacy, and content area.

In Table 1, the numbers and percentages of computer literate and non-literate vocational teachers are documented. The table designates percentages and numbers by whole population, post-secondary teaching level, and secondary teaching level. Of the whole population of vocational/technical teachers surveyed, fifty percent were computer literate and fifty percent were not. These

Table 1
Percent and Number of Whole Population, Postsecondary
and Secondary Vocational Teachers who are Computer
Literate and Non-Computer Literate

Category	Number Literate	Number Non-Literate	Percent Literate	Percent Non-Literate
Whole Population	58	57	50	50
Postsecondary	19	21	48	52
Secondary	39	36	52	48

figures were consistent with the national 1989 study conducted for IBM (Wirthlin Group, 1989). The national study indicated that fifty-two percent of the responding teachers did not feel they were computer literate.

Table 1 additionally documents that forty-eight percent of the postsecondary vocational/technical teachers were computer literate while fifty-two percent were not. The secondary teachers surveyed indicated a computer literacy level of fifty-two percent, with forty-eight percent being not-literate. All variations in percentages were within a normal level of significance of five percent. Therefore, the difference between the postsecondary and secondary percentages were statistically insignificant.

In Table 2, the numbers and percentages of computer literate and non-literate teachers are documented by content area. The content areas are listed by teaching level, postsecondary and

Table 2

Percent and Number of Whole Population, Postsecondary, and Secondary Vocational Teachers who are Computer Literate and Non-Computer Literate by Content Area

Content Area	Whole Population				Postsecondary				Secondary			
	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.
Auto Body	0	0	100	2	NA	NA	NA	NA	0	0	100	2
Auto Mechanics	44	7	56	9	0	0	100	5	64	7	36	4
Aviation Frame/Power	67	2	33	1	NA	NA	NA	NA	67	2	33	1
Construction Trades	60	12	40	8	NA	NA	NA	NA	60	12	40	8
Cosmetology	25	1	75	3	NA	NA	NA	NA	25	1	75	3
Culinary Arts	0	0	100	4	0	0	100	1	0	0	100	3
Drafting	73	11	27	4	100	5	0	0	60	6	40	4
Electronics	100	12	0	0	100	8	0	0	100	4	0	0
Fire Science	100	1	0	0	100	1	0	0	NA	NA	NA	NA

(Note: NA indicates not applicable. Not a content area for the indicated level.)

Table 2 (Cont.)

Percent and Number of Whole Population, Postsecondary, and Secondary Vocational Teachers who are Computer Literate and Non-Computer Literate by Content Area

Content Area	Whole Population				Postsecondary				Secondary			
	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.
Graphic Arts	30	3	70	7	25	2	75	6	50	1	50	1
Health Occupations	50	3	50	3	NA	NA	NA	NA	50	3	50	3
Industrial Mechanics	100	1	0	0	100	1	0	0	NA	NA	NA	NA
Law Enforcement	0	0	100	2	0	0	100	2	NA	NA	NA	NA
Marine Mechanics	100	1	0	0	NA	NA	NA	NA	100	1	0	0
Orn. Horticulture	0	0	100	2	0	0	100	1	0	0	100	1
Photography	33	2	67	4	50	2	50	2	0	0	100	2
Refrigeration	50	1	50	1	0	0	100	1	100	1	0	0
Welding	14	1	86	6	0	0	100	3	25	1	75	3
Telecommunications	0	0	100	1	NA	NA	NA	NA	0	0	100	1

secondary, and by whole population. Teaching level information was not a major factor in several of the content areas as ten of the nineteen instructional subjects were found at only one of the two levels. Comparisons of the different levels in a specific subject area was also not completely reliable as there were often large differences in the numbers of teachers at the different levels. This made direct level comparisons unreliable. A few specific instructional areas had such small numbers of total respondents at all levels that the data about these content areas can not be reliable.

The whole population data in Table 2 indicated that some content areas had very high levels of computer literacy while others had very low levels. The content areas with large sample responses indicating high computer literacy levels were drafting and electronics. Electronics teachers indicated the highest computer literacy levels of all content areas with 100 percent literacy at both the secondary and postsecondary levels. The second highest computer literacy levels were among drafting teachers at seventy-three percent literacy for the whole population. The postsecondary teachers had a higher literacy percentage at 100 percent, but that level also had half as many teachers as the secondary level. The secondary level drafting teachers, with a total teacher count of ten, indicated a literacy level of sixty percent.

The content areas with large sample responses indicating low computer literacy levels were auto mechanics and graphic arts. The auto mechanics need for computer training was evenly split between the secondary and postsecondary levels with five needing training in postsecondary and four needing training in the

secondary level. The need for computer literacy training for graphic arts was more prominent at the postsecondary level with six teachers needing training while the secondary level had only one vocational teacher needing computer literacy training.

Prior Formal and Informal Education

The second data area deals with previous formal and informal education and how it pertains to computer literacy. This information addresses the third research question related to prior education and whether it impacts computer literacy. The survey instrument questioning strategy requested information about where vocational teachers received their training related to the subject area taught.

Table 3

Percentage of Computer Literate and Non-Computer Literate Vocational Teachers Receiving Content Area Training from Different College and Industry Sources

Category	2-Year College	4-Year College	Industry/ Apprenticeship	Combined College/Industry
Computer Literate	22%	60%	12%	6%
Non-Computer Literate	24%	58%	13%	5%

In Table 3, each of the four primary sources of training, two-year college, four-year college, industry/apprenticeship training,

and combined areas were listed. A response category for "Other" was provided on the survey instrument but not used by respondents to indicate any information that was not already in the first four categories. The percentages of teachers trained by each instructional model were very similar.

The majority of all vocational teachers surveyed, with an average of fifty-nine percent, were trained in a four-year university. An additional twenty-three percent of the whole population were trained in a two-year college. Twelve and one-half percent of the surveyed vocational/technical teachers were trained in industry/apprenticeship programs while five and one-half percent were trained in a combination of industry and college programs. As the differences between computer literate and non-computer literate teachers were two percent or less in every category, the results would indicate that there is no significant statistical difference in computer literacy based on origin of instructional area professional training.

Specific Skill Levels

The third data area specifically defines the level of skills for each respondent. This response area addressed the fourth research question dealing with the identification of specific skill levels of all teacher-respondents. The questioning strategy of the survey instrument had the respondents indicate each of the computer skills that they possessed.

Failure to make an affirmative response to any of the questions, identified the individual as category "A," No skills. As each of the following skills identified on the questionnaire became more advanced, the final "yes" response indicated the highest level of attainment of the responding teacher. Each of the four skill questions indicated an additional specific skill level classification above the "no skill" classification. The responding teachers were classified at one of the five skill levels depending on their final positive response.

Figure 1 documents the skill levels reported by the surveyed teachers. Category "A," no skills, had a twenty-one percent response. Category "B," hardware literacy, had the smallest response percentage with a four percent response. Category "C,"

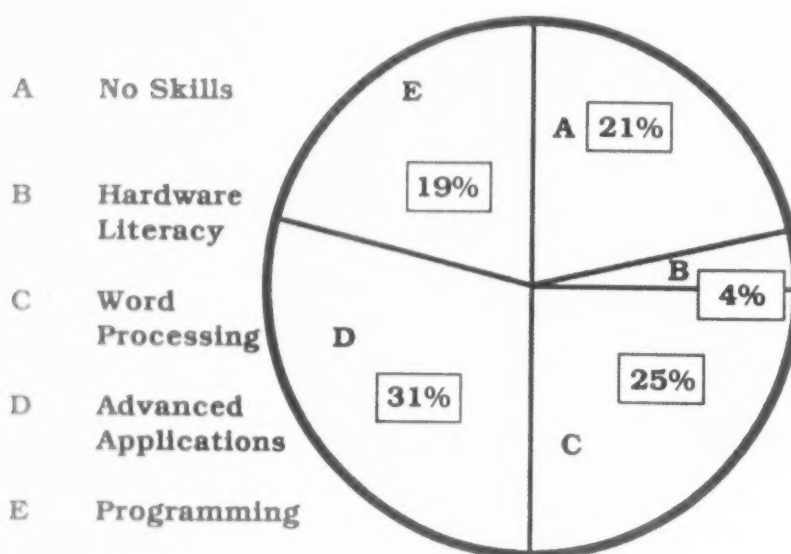


Figure 1

Vocational Teachers Highest Computer
Skill Level Attained

word processing and the last non-literacy category, had the second highest response rate of twenty-five percent. The two categories that indicated computer literacy, "D," advanced applications program usage and "E," program writing skills, had a response rate of thirty-one percent for "D," nineteen percent for "E," and a collective response of fifty percent.

Demographics

The fourth data response area recorded the information necessary to address the fifth research question dealing with what demographic conditions impact computer literacy. The specific areas of demographic questioning were age and gender. Table 4 documents the relationship between age and computer literacy.

Table 4

Percentage of Computer Literate and Non-Computer Literate Vocational Teachers in Different Age Groups

Category	21-25 Years	26-30 Years	31-35 Years	36-40 Years	41-45 Years	46-50 Years	51-55 Years	55& Up
Computer Literate	0%	2%	17%	16%	22%	9%	22%	12%
Non- Literate	0%	9%	12%	12%	23%	21%	12%	11%

Prior to this study, the computer science faculty indicated they felt that age was a significant factor in computer literacy. They

felt that older people were less computer literate. Looking selectively at the data, the statistics would appear to indicate the contrary. While only two percent of the computer literate teachers were in the age group twenty-six to thirty, nine percent of the non-literate teachers were in this age category. In the computer literate age group of fifty-one to fifty-five years old, twenty-two percent were computer literate while twelve percent were not-literate in the same age group. The youngest age group indicated on the survey, twenty-one to twenty-five, had no respondents to the survey.

Comparing the computer literacy and non-literacy of larger age groupings, however, provides a more consistent comparison. Of those teachers from thirty-six to over fifty-five, eighty-one percent of the computer literate teachers and seventy-nine percent of non-literate teachers were in this age range. From forty-one to over fifty-five years old, fifty-nine percent of the computer literate and fifty-six percent of the non-computer literate teachers were in this age range. The closeness of the percentages while comparing larger age groups would indicate that there is little correlation to age and computer literacy.

The study results on gender as it affects computer literacy were inconclusive. Figure 2 documents the percentages of males and females that responded to the survey. Of the whole population of vocational teachers in Southern Nevada, ninety percent of the respondents were male while only ten percent were female. Table 5 indicates the percentages of males and females that were or were not computer literate. Of the whole population, fifty-two percent of the males were computer literate while only thirty-six percent of

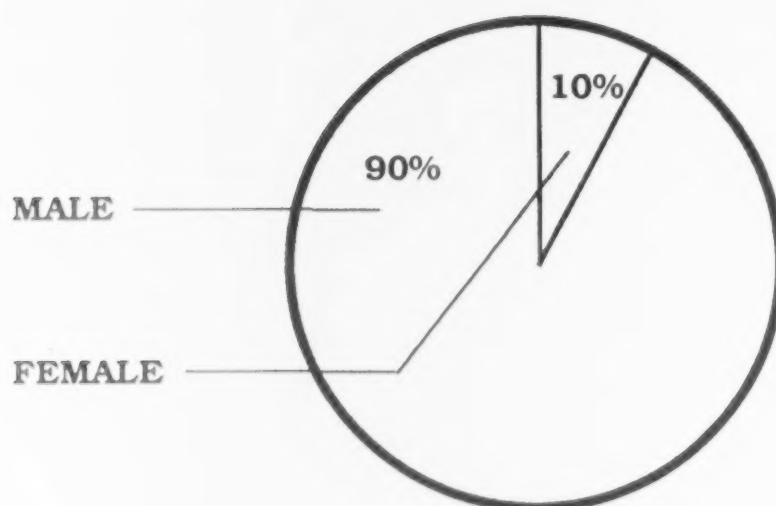


Figure 2

**Percentage of Southern Nevada Vocational Teachers
Responding to Survey, by Gender**

Table 5

Percent and Number of Vocational Teachers who are
Computer Literate or Non-Literate by Gender

Category	Male				Female			
	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.	Literate %	Non-Literate No.
Whole Population	52	54	48	50	36	4	64	7
Post- Secondary	46	18	54	21	100	1	0	0
Secondary	55	36	45	29	30	3	70	7

the females were computer literate. Although this would appear to be a significant statistical difference, the small number of available responding females makes gender comparisons inaccurate and unreliable. The two gender groups did not have close enough total numbers to determine valid comparative results. The gender data, although informative about gender parity, is inconclusive.

Origin of Computer Literacy Training

The fifth data area, location of computer literacy training, addresses the sixth research question which attempted to determine where computer literate teachers obtained their training. This area of questioning also attempts to determine if the computer literate vocational teachers obtained their computer training before beginning to teach or after. Figure 3 documents the information related to the origin of computer training for computer literate vocational teachers. Figure 4 addresses computer training before or after beginning teaching.

In the responding categories, the least computer training for computer literate vocational teachers, two percent of the total, was obtained from industry training. Two-year colleges accounted for seven percent of the computer training, four year colleges ten percent, and on-the-job-training nineteen percent. Most respondents indicated that on-the-job-training primarily consisted of a combination of industry and educational in-service courses and self-instruction. The largest source of vocational teacher computer training was from self-instruction, sixty-two percent.

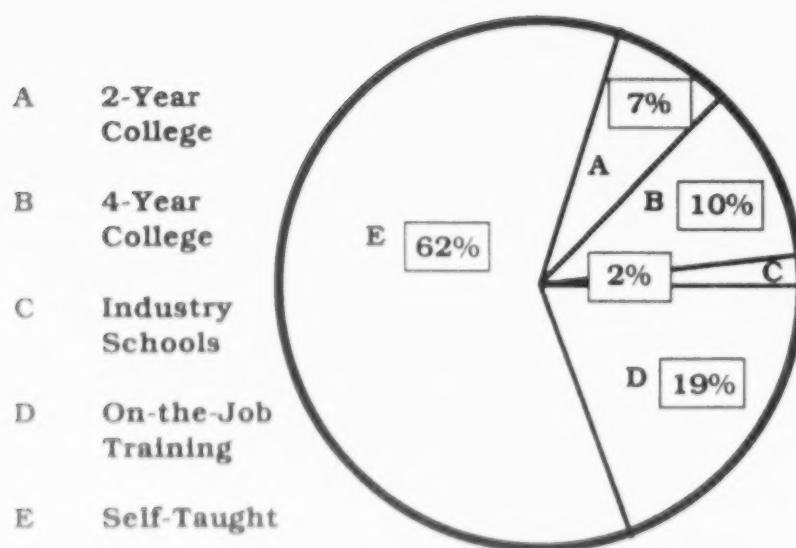


Figure 3

Origin of Computer Training for Computer
Literate Vocational Teachers

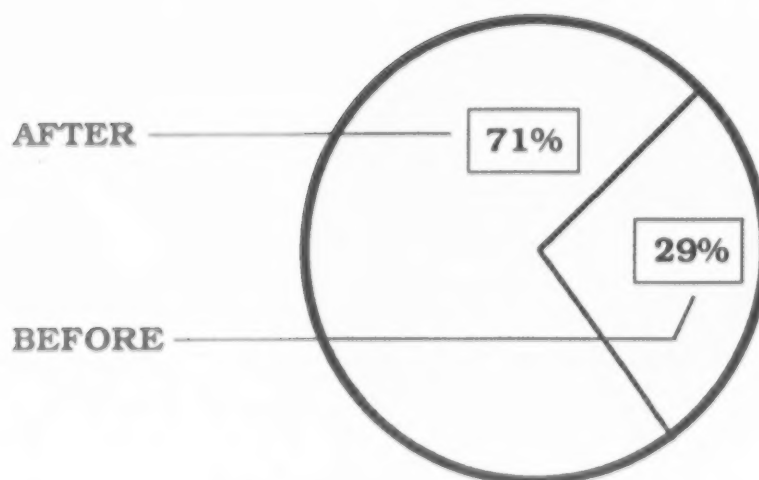


Figure 4

Percentage of Vocational Teachers Who Learned Computer
Skills Before or After Beginning To Teach

Figure 4 documents that seventy-one percent of the computer literate vocational teachers learned their computer skills after becoming teachers. This information is confirmed by the origin of computer training data which indicated that most teachers were self-taught. The correlation of data would indicate that the majority of computer literate teachers taught themselves computer skills after becoming teachers.

The foregoing analysis represents a profile of the computer skills and related characteristics of the vocational/technical teachers in Southern Nevada. The research portion of this MARP has identified the basic computer literacy skills, determined the need for computer literacy training, and identified the impacting information about the potential student that is necessary for solution strategies. The results of the study have provided a conceptual base for the development of a teacher computer literacy training program.

Chapter 5

INTERPRETATION, CONCLUSIONS, AND RECOMMENDATIONS

The final chapter will contain four separate sections: interpretation, conclusions, recommendations, and the proposed computer literacy training model, the Teacher Computer Literacy Workshop.

Interpretation

Literacy and Non-Literacy

The number of vocational/technical teachers that were determined by this study to be non-literate comprised a significant enough number that their computer literacy training must be addressed. The study indicated that slightly more secondary teachers were computer literate than postsecondary teachers. Some researchers (Naisbitt, 1984) indicated that secondary vocational teachers tend to have more computer training than their college faculty colleagues. This appeared to be correct based on this study, but with the statistical differences being less than a reasonable five percent level of significance. Therefore, statistically, there is no difference.

With fifty percent of the vocational teachers needing computer literacy training, this study verified the need to provide computer training for Southern Nevada vocational teachers. Based on the numbers and percentages of teachers needing training, a

program will have to be implemented in Southern Nevada. At the postsecondary level, the available trainers at the Clark County Community College could reasonably conduct a workshop with a maximum of eight teacher/participants. With this potential, the college could conduct one seminar each month and provide instructional services for all teachers needing instruction within a three month time period.

The Clark County School District, which has more vocational teachers in need of training, could reasonably train half of their faculty in six months. The normal method of training for the school district might be conducted through the Teachers' Computer Center. This center, although primarily directed toward elementary school needs, could function as a training agent and facility for many of the district teachers. The Clark County Community College computer staff would be willing to work in a partnership agreement to help the school district train their teachers.

Content Areas and Instructional Levels

The data from the survey indicated that there was no significant statistical differences between the percentages of secondary and postsecondary vocational teachers that were or were not computer literate. This would tend to indicate that the instructional model for both levels is fairly consistent and that neither level is providing any substantially improved computer training over the other level. The numbers of secondary teachers needing training are greater than the postsecondary numbers, but

the secondary teachers surveyed consisted of a larger original sample number.

The type of instruction that would need to be provided for the two levels would generally be the same. The limited resources of the secondary schools, however, and the lack of a training agency on line will probably compel the school district to take a longer time in training its vocational teachers. A training program conducted by the community college in partnership with the school district would facilitate rapid training.

The specific content areas that surveyed as being exceptionally high in computer literacy, electronics and drafting, would not need to be highly recruited or specifically targeted for in-service training as their career training seemed to provide them with substantial amounts of computer training. The electronics teachers indicated, during their interviews, that they often became interested in computer operation after repairing them. This was the primary motivation for computer studies among the responding electronics teachers. The drafting teachers cited in-service CAD training from CAD software sales companies as the basis for their computer literacy training. Computer-assisted design has been the first introduction of computer technology into secondary and post-secondary curriculum in Southern Nevada. The drafting teachers responded to this trend by participating in free seminars conducted by CAD software developers.

The opposite end of the content literacy scale requires substantial investigation and effort. The content areas showing limited computer literacy, graphic arts and welding, indicated a

need for computer training. Workshop organizers will need to put forth a concerted effort to recruit these faculty members to participate in the training workshops. The instructional staffs will need to target instruction to these groups by finding out what competencies would be of the most use to them, as well as finding content-specific software for advanced training.

Several of the instructional areas, auto body, aviation airframe and power-plant, culinary arts, fire science, industrial mechanics, law enforcement, ornamental horticulture, refrigeration, and telecommunications have such small sample numbers that any data related to these subject areas can only be interpreted for the specific group. The sample sizes for some specific content areas were too small to derive any meaningful information about the teachers in these trade areas. Three of the content areas, industrial mechanics, telecommunications, and marine mechanics had only one instructor in Southern Nevada for each subject. Obviously, the data related directly to the three individuals were valid for these teachers, but the lack of additional teachers in the same subject area provided too little data to provide any basis for reliable interpretations related to these specific subject areas.

Specific Skill Levels

Of the surveyed vocational teachers that were not computer literate, twenty-nine percent indicated they had some rudimentary experience with computer usage at the hardware literacy or word processing levels. This prior experience clarified the need to insure that the instructional workshops are unit or module

organized. Participants should be allowed access to any units or modules provided but should not be compelled to waste valuable time on skills already mastered. The survey response data indicated that of the teachers that needed to be trained, twenty-two percent had absolutely no skills and must start from the lowest instructional level.

With a fairly large percentage of teachers having some prior experience without literacy, these participants would probably prefer to start at a higher skill level. Mixing these moderately advanced students with non-skill students could create anxiety and discomfort for both groups. Ability-grouping the participants would be a reasonable solution.

Demographic Factors

The demographic factors of age and gender, based on the survey data, do not appear to be significant contributing factors. The age distributions did not indicate that more older teachers lacked computer literacy than the younger teachers. Selective data comparisons would make it appear that older teachers are more computer literate than younger teachers. Comparing larger age groups than the survey instrument offered, the age comparisons for computer literate and non-literate teachers are nearly even. No major trends or literacy factors were indicated by the study data. As a result, the instructional methodology or service targeting strategy would not need to be substantially modified from a program or procedure already strong in andragogical learning theory. This

study indicated that age does not appear to be a contributing factor to computer literacy.

Gender information seemed to be inconclusive. There were so many more men surveyed than women, a clear reliable comparison could not be conducted. The statistics that indicated 52 percent of men vocational teachers were computer literate while only 36 percent of women teachers were computer literate are invalid. With only ten percent of the Southern Nevada vocational teachers being women, the data collected about this group could only be inferred for the surveyed group with no valid gender comparisons.

The most important interpretation would be to indicate that a substantial gender imbalance exists in vocational education in Southern Nevada. Realizing that many of the industrial content areas of vocational/technical education have been traditionally a male domain, there are many technical areas in which women could reasonably be employed if administrators were reluctant to have a woman teaching welding shop. As Southern Nevada vocational/technical schools have many non-industrial training programs, it would appear that either gender discrimination is being practiced or few women are training for vocational teaching careers.

Professional and Computer Education

Professional training for trade or technical instructional area provided little usable data. As the majority of the sample individuals trained through the professional educational model rather than

industry, there was not a large enough industrially trained group to infer any significant information. The industry trained group had comparable computer literacy levels to college trained teachers, which would infer that industrial training did not provide substantially more or better computer training for future teachers.

The most significant data related to computer skills training for those who were indicated as literate was that the majority, sixty-two percent, were self-taught. This would confirm the hypothesis offered by many computer experts that secondary and post-secondary schools are providing very little computer training for teachers. The data indicated that neither the two-year or four-year schools provided any more or less training than the other. That would additionally indicate that few of the postsecondary schools, at either the junior or senior college level, are providing substantial training.

Additional confirmation of the lack of quality training hypothesis can be interpreted from the fact that the majority of the sample individuals, seventy-one percent, indicated that they learned their computer skills after becoming teachers. Although some of these respondents completed their professional educational training before computer instruction was available, the large overall percentage of persons learning after becoming teachers is a clear indicator that older teachers are not unreasonably skewing the data. Certainly, the age of the teachers is a contributing factor but not the concluding factor.

A sixth source for computer training was overlooked on the questionnaire, but determined by sample responses. As very few

computer workshops have ever been conducted in Southern Nevada, the instrument design committee did not consider this form of training a reasonable alternative for the sample geographical area and elected to not include it as a response area on the survey instrument. That supposition being reasonably correct for teachers trained in this geographical area, did not take into consideration the possibility that teachers might have received training in another part of the country that offered workshop/seminar instruction.

Two respondents indicated receiving workshop training locally while six respondents from varied content areas indicated that they had received some computer instruction from workshops conducted by colleges in other locales. Almost 100 percent of the drafting teachers indicated that they had received workshop instruction from industry trainers and computer software manufacturers selling CAD software. With the exception of the drafting teachers, the number of teachers responding that they had received workshop-type computer training constituted a statistically insignificant amount.

Conclusions

As a result of this study, the following conclusions are presented.

1. A significant number of vocational/technical teachers in Southern Nevada are not computer literate. The percentages of non-literate vocational/technical teachers are consistent with national survey averages for all disciplines. The significant numbers

and percentages justify addressing the problem and implementing solutions.

2. Certain content areas tend to provide more computer training than others. The instructional disciplines that generally provide computer training are electronics and drafting. The high percentages of drafting teachers indicating literacy is explained by the fact that this content area is industry directed. Industry and software manufacturers are expending major resources to insure training of these teachers to provide trained students for industry and knowledgeable consumers for software products. Some content areas, graphic arts and welding, provide little computer training as part of professional instructional preparation or career in-service training.

3. The demographic factors of age and sex do not significantly impact computer literacy. The fact that many of the teachers that are computer literate completed professional training before computer training was available in the colleges indicates that they learned their skills after becoming teachers but does not indicate that as an age group these teachers are less computer literate.

4. Vocational/technical teachers have not received adequate computer literacy training either in schools or in industry. The large numbers of computer literate teachers who indicated that they were self-taught, combined with the teachers that indicated no literacy, provided substantial evidence that industry, public education, and private education are not providing adequate computer training for vocational teachers.

5. There is a need for the Teacher Computer Literacy Workshop in-service computer training program for practicing Southern Nevada vocational/technical teachers.

Recommendations for the Improvement of
Practice, Including Strategies for
Diffusion, Implementation,
and Improvement

As a result of this study the following recommendations are suggested.

1. It is recommended that the Teacher Computer Literacy Workshop be implemented as soon as possible. As a part of this process, the program should be presented to the Academic Standards Committee for the Clark County Community College at the next scheduled meeting in September, 1990, for formal college level approval.

2. It is recommended that the Clark County Community College develop and adopt computer literacy training policies and procedures to insure that currently deficient teachers in all disciplines be provided the opportunity and resources necessary to become computer literate. Additionally, the college-wide policies should be designed to pertain to all new faculty entering the college. It is further recommended that the college divisions immediately implement the assessment portion of the Teacher Computer Literacy Workshop to use in evaluating existing division and department faculty computer literacy levels and as an assessment tool in the process of hiring of new faculty.

3. The results of this study should be provided to the two teacher-training programs in Nevada for the purpose of program evaluation and master-planning. Additionally, the Universities of Nevada at Las Vegas and Reno should adopt the Teacher Computer Literacy Workshop as an interim program for up-dating teachers' skills until an alternate policy and program is developed by these schools.

4. The faculty of the Clark County Community College Computer Graphics and Computer Science Departments should make application to the state department of education administered Greenspun Technology Grant Program for new funding for computer training hardware and software to implement a permanent teacher-only computer training lab.

5. The Clark County Community College In-Service Training Department should authorize and designate a computer consultant or resident expert for each college campus. It is further recommended that the in-service department adopt the Teacher Computer Literacy Workshop format as an on-going permanent component of the school's in-service program.

6. The local school district Board of Trustees for the Clark County School District should adopt the Teacher Computer Literacy Workshop and policies similar to the college system for teacher computer literacy training. It is further suggested that the two agencies develop a partnership agreement allowing the two school systems to share resources and provide consistent comparable computer training.

Teacher Computer Literacy Workshop Proposed In-Service Program

This section of the study will describe the proposed computer literacy in-service program for the Southern Nevada area vocational/technical teachers. The sections of this program that are included in this chapter are as follows: (1) program design and format; (2) faculty; (3) facilities requirements; (4) analysis, to include needs assessment, task analysis, and student analysis; (5) program, unit, and behavioral goals and objectives; (6) instructional organization; (7) instructional implementation; (8) evaluation; and (9) revision procedures. Implementation of this program should occur during the 1990-1991 school year.

Program Design and Format

The Teacher Computer Literacy Workshop was designed using a systems approach to curriculum design. The design method was similar to curriculum design methodology described by Gagné, Briggs, and Wager (1988) and Herrscher, Mizell, and Pautler (1986). Curriculum elements were addressed in a format providing for systematic design evaluation by either the designer or an outside expert. The systems approach also allows for a specific institutional standardized program or curriculum evaluation instrument/model (Appendix B).

The purpose of the Teacher Computer Literacy Workshop is to provide computer instruction for teachers in the basic computer skills: (1) hardware literacy, machine operations; (2) word

processing; (3) computer managed instruction using spreadsheet, database, and gradebook programs; and (4) computer graphics for the purpose of creating instructional materials. This instruction will be designed for teachers who have limited or no prior computer experience or instruction.

The workshop is designed to be presented in two different formats. Each block of instruction is designed to be used either as an individual unit in an over-all course or to be presented as a stand-alone module with the module representing a single seminar or mini-workshop. Having the unit/modules clearly separated allows the student to attend any single block of instruction desired without having to participate in unwanted or unneeded segments.

Recommended Hardware. The workshop is designed to instruct students in the two most common computer environments currently used in education and industry, Apple Macintosh and IBM PC. The ideal instructional operational configuration for the Macintosh computer is with a minimum of one floppy disk drive and a 20Meg internal hard-disk drive. The IBM PC requires one internal floppy disk drive and a 40Meg hard disk drive.

Recommended Software. The software recommended for this workshop are:

1. Macintosh. "Macintosh Guided Tour," Apple Publications; "Word" Version 3.02, Microsoft Corporation; "FullPaint," Ann Arbor Software; "SuperPaint," Silicon Beach Software Publishers; and "PageMaker" Version 3.0, Aldus Publications.

2. IBM PC. "IBM Guided Tour," IBM Publications; "Write," with "PC Windows," Microsoft Corporation; "Word for Windows," Microsoft Corporation; "Deluxe Paint II Enhanced," NewTek Software; and "PageMaker for IBM," Version 4.0, Aldus Publications.

Recommended Tutorials. The tutorials recommended for this workshop are:

1. Macintosh. "Macintosh Guided Tour," Apple Publications; "On, Off, Open, Close, and Save on the Macintosh," J.L. Pomeroy, Palms & Rhodes Publisher; "Campus Chronicles on PageMaker," J.L. Pomeroy, Palms & Rhodes Publisher; and "PageMaker Tutorial," Aldus Publications.

2. IBM PC. "IBM Guide Tour," IBM Publications; "On, Off, Open, Close, and Save on the IBM," J.L. Pomeroy, Palms & Rhodes Publisher; Desktop Publishing using PageMaker on the IBM, Don Busché, Prentice Hall Publisher.

Faculty

The faculty selected for this workshop must have several specific characteristics.

1. The instructional staff member must be thirty years old or older where possible and be a peer of the student group. Preferably, the instructor should be from the same school and campus as the workshop participants.

2. The faculty member should be experienced in the principles of andragogy and be experienced in teaching adults.

3. The staff member should have exceptional interpersonal skills and be capable of compassionate counseling of students when necessary.

4. The instructional staff must be of mixed gender, therefore qualified female instructors will be given preference in appointment to encourage gender equity in faculty numbers.

Facilities Requirements

The facilities requirement for the workshop include a computer lab dedicated solely to workshop participant use during instructional hours and designated lab hours. The facilities should have enough space to house at least twelve computers, one for each student for a maximum student number of ten, with two additional computers.

The facility must be equipped with one electrical circuit for each three computers, with twenty amp service to the receptacles. The electrical lighting should be bright, with the ability to subdue or reduce the overall lighting as well as turn all of the lights off for film or video presentations. The facilities should be located near normal comfort facilities such as drinking fountains and restrooms.

Analysis

Needs Assessment. Traditionally, the community college would assess local trends, and in anticipation of future local needs or in direct response to industry requests, create new programs. The need for this program, however, was determined by faculty request and in response to the data obtained from this study. This

provided the need to design and conduct a workshop to improve computer literacy skills for teachers. Additionally, for this program the faculty requests and study data determined the scope of the workshop.

Task Analysis. Task analysis was determined from three sources. First, tasks were identified by the faculty requesting the workshop when they indicated the specific tasks that they wished the workshop scope to cover. Second, faculty members from the Computer Science and Computer Graphics Departments participating on the Instrument Design Committee for the Computer Usage Survey Questionnaire identified tasks that they felt were essential. The third source, which was also reviewed by the design committee was a literature search reviewing programs offered by other institutions to accomplish the same goals. The specific tasks identified were: (1) Basic computer operations (hardware literacy); (2) operation of the computer mouse and pull-down menus; (3) word processing; (4) computer managed instruction, to include gradebook and student management programs and spreadsheet/database programs; (5) basic computer illustration; and (6) computer generated instructional materials.

Student Analysis. The Teacher Computer Literacy Workshop will be directed toward instructional faculty and staff that have limited computer literacy. Each potential workshop participant will be personally interviewed or surveyed using the Pre-Assessment Form (Appendix C) to determine their individual skill levels. The pre-assessment will allow the instructional staff to facilitate placement in the individualized workshop program instructional

matrix. Determination of recommended student placement and targeting of instruction will be based on the specific skills listed above that participants possess.

Objectives

Workshop Objectives and Goals. The primary goal of the workshop is to improve the participants' computer literacy and applications skills. The workshop participant should be able to recognize, understand, and apply computer vocabulary. The student should also become computer literate, understanding the operation and potential applications of computers.

The workshop's objectives include instructing the participants in the successful use of word processing, basic illustration, and page assembly software. Emphasis is placed not only on operation but on the skills necessary to make decisions related to selection of the correct applications software for the specific teacher/classroom need.

As a result of course participation, the student should be able to make valid decisions in relation to computer hardware and software selections for computer-managed instruction for the teacher and computer-assisted instruction for the classroom. A primary goal of the workshop is to improve the participants' confidence with computers in anticipation that the improved self-confidence will improve the participants' attitudes about using the computer for professional and personal needs.

Unit/Module Objectives. The following information outlines the unit/module objectives.

1. Computer Hardware Literacy. Students will develop computer literacy by successfully demonstrating hardware operations and operating computer mouse functions for menu by demonstrating the ability to apply and adapt computer concepts and principles.

- A. Students will identify and correctly apply computer literacy vocabulary.
- B. Students will correctly power-up and shut-down machines.
- C. Students will successfully load programs or files from floppy disk or hard-drive into computer memory.
- D. Students will successfully save files, data, and programs to floppy disk or hard-drive.
- E. The students will demonstrate operational application of the computer keyboard.
- F. Students will identify and correctly apply vocabulary specific to mouse operation and pull-down menus.
- G. Students will successfully operate and apply pull-down menus as the functions pertain to computer literacy.
- H. Students will open menus and programs with the mouse.
- I. Students will perform system internal shut-down with the mouse.

- J. Students will save to disk and load files and programs from disk with the mouse.
- 2. Word Processing. Students will demonstrate skill competency with one word processing program.
 - A. Students will identify and correctly apply vocabulary specific to word processing.
 - B. Students will demonstrate competency with text generation, movement and manipulation.
 - C. Students will demonstrate competence in changing of typeface and type size.
 - D. Students will successfully operate "spell-check" in program.
- 3. Computer Managed Instruction. Students will demonstrate skill competency with one gradebook, student management, or spreadsheet program.
 - A. Students will identify and correctly apply vocabulary specific to gradebook, student management, and spreadsheet programs.
 - B. Students will enter demographic data and statistical parameters into the specific gradebook or similar program.
 - C. Students will construct data reporting systems in the gradebook or spreadsheet program.
 - D. Students will generate data and correspondence from the program.

4. Computer Design. Students will demonstrate competency in operating one basic draw/paint program.
 - A. Students will recognize, understand, and apply vocabulary specific to basic computer illustration.
 - B. Students will draw straight and freehand lines.
 - C. Students will manipulate textures and shades.
 - D. Students will create geometric shapes.
5. Computer Generated Instructional Materials. Students will demonstrate competency in operating one page assembly program.
 - A. Students will recognize, understand, and apply vocabulary specific to page assembly and desktop publishing.
 - B. Students will create page and/or unit formats.
 - C. Students will manipulate text and graphics by importing from other files or generating them from within the program.

Performance Objectives. Performance objectives are determined for each of the skill areas indicated. The performance objectives will not be specifically listed in this chapter but may be reviewed in Appendix D.

Instructional Organization

Scope. The workshop will deal with basic computer literacy as it relates to traditional keyboard and computer mouse and pull-down menu environments. Additional areas of instruction will be

computer generated word processing, simple illustration, and instructional material creation through page assembly.

Activities and Strategies. The specific workshop instructional activities and strategies are:

1. Lecture -Each unit will be explained by the instructor.
2. Reading -Each unit will be explained in the text. Each lab will be explained in a text.
3. Demonstration -Each unit will be demonstrated on the appropriate hardware while being projected on the overhead projector screen.
4. Lab Tutorials -Each unit has a self-paced and self-directed tutorial to lead the student through each set of unit objectives.
5. Lab Assignments-Each set of skills will have a competency-based lab experience for practicing new skills (See Appendix E).
6. Performance Exams - At the completion of each unit, the student will take a performance exam to demonstrate competency.

Resources. The recommended course resources should be:
(1) one lecture/demonstration instructor; (2) one additional lab instructor; (3) one large lecture classroom/lab; (4) one overhead computer projection screen; (5) handouts, reference materials, and tutorial texts for each unit; (6) twelve IBM PC/2 computers and ten Macintosh computers; (7) CAI tutorials for each of the computer programs and units; (8) a Learning Resource Center; and (9) current applicable publications.

Rationale for Strategy Selection. The following information presents the rationale for the specific solution strategies.

1. Reading related to the specific unit under study is assigned the day before the unit is started. The reading strategy is selected to target visual learners.
2. Each unit is explained in lecture and then immediately demonstrated on the appropriate hardware. Demonstration of the skills is projected onto an overhead projector screen to allow the student to see every detail of the instruction. These strategies are selected to target visual learners and audio learners.
3. The student participates in a lab CAI tutorial experience. Each element and objective of the unit is explained and directed on the computer screen. The tutorials are student directed and paced. Each step of the tutorial is explained in the tutorial text. The CAI tutorial is selected as it allows the student self-paced instruction. The CAI targets visual and tactile learners. The tutorial text targets visual learners.
4. The performance exam allows the student to evaluate his competency progress. The feedback targets all learning preferences.
5. Use of several strategies allows students with different learning preferences several options to select to assist their learning experiences.

Instructional Implementation

Organization of Activities. The activities selected for this workshop are organized in the following sequence:

1. Pre-assessment. Each student is evaluated using a pre-assessment instrument to determine the level of competency in each of the subject/unit areas (See Appendix C). The student is then placed in the lowest level unit where competency is not present. As the instruction is individualized, students need not receive instruction in a unit where they have demonstrated competency or feel that they are competent. The student may however, take any and all units as desired.
2. Reading. Each student receives a reading assignment on the specific unit at least one day before the unit is presented.
3. Lecture. Each unit is explained in lecture and with overhead projector as needed.
4. Demonstration. After explanation, each skill is demonstrated on the hardware and overhead projector with additional or review explanation.
5. Student Lab Participation. The student operates the specific piece of equipment, tutorial, or computer program until he/she is satisfied that competency has been achieved.
6. Unit Performance Test. When the student indicates that he/she feels that the specific unit has been mastered, a performance test is conducted to determine the level of competency.

Media Selection and Rationale. The following media and rationale for selection were determined by the instructional content and methodology of instruction.

1. Lecture Demonstration Instructor. The instructor provides for in-depth and variable verbal and visual instruction on

subject material. Additionally, the instructor can respond directly to questions on information or lab participation difficulties. The instructor presents varied instructional media and addresses varied learning styles.

2. Lab Instructor. The lab instructor has the same role as the lecture instructor but is limited to lab operations. Again, the lab instructor presents varied instructional media and addresses varied learning styles.

3. Overhead Projector with Computer Projection Screen. This device allows the instructor to demonstrate computer monitor activities on a large visual area and in room-light.

4. Computers. As the instruction is computer operation and function centered, use of various computer types is appropriate for content.

5. Computer Software. The application of computer software is the main focus of the course of instruction. Use of software is therefore essential.

6. Student Self-Directed Tutorials. The tutorials allow the students to work individually at their own pace. This medium addresses individual needs and pace of learning.

7. Texts. Textbooks are used for reading and reviewing background material. This method is particularly useful for visual learners.

8. Publications. Publications are used in the course of study to allow the students to see practical applications of computer skills in business and industry. They also provide enrichment learning experiences.

Evaluation

Developmental Testing and Design Evaluation. Each of the instructional units and tutorials designed for use in the workshop were developmental tested after design. First, the units were tested with two students and one lab assistant before classroom employment. After field-testing with individual students and the lab assistant and modifications were made, the tutorials and instructional units were presented to four small classroom groups of ten students each for three consecutive semesters. The trial test student groups were freshman adult students learning computer skills for the first time. At the completion of each semester of trial implementation, the units were reviewed and modified as necessary.

Two of the tutorials were commercially produced. The first one, "The Guided Tour of the IBM PC" is used as produced. The tutorial for Apple Macintosh "The Guided Tour of Your Macintosh" is used as produced. The commercially produced introductory tutorials for the IBM and Apple Macintosh lacked sufficient drill in some basic functions and provided no later convenient reference for the student. The limited drill capability and lack of reference compelled the creation of two additional tutorials to offset the limitations. "On, Off, Open Close, and Save on the Macintosh" and "On, Off, Open, Close, and Save on the IBM-PC" were created to fill the instructional tutorial gap.

Unit Formative Evaluation. Unit formative evaluation is the process of evaluating each individual instructional unit during the instructional process.

1. The instructional team will observe the presentation of each unit documenting elements that are not productive.
2. Student comments, recommendations, and responses to instructional units and materials will be solicited. Any responses provided during instructional times will be recorded by the instructional team members at the time responses are presented.
3. Modifications within the unit will be conducted if identified by the evaluation process and determined to be warranted by the instructional team.

Unit Summative Evaluation. Unit summative evaluation will be conducted at the end of unit of study.

1. Each unit and the total combined units will be observed by the instructional team to determine if the unit's instructional content, delivery system, and instructional media met the objectives.
2. Each unit will be evaluated by the student at the end of the unit to determine if the student felt that the unit objectives were achieved. Unit evaluation will be recorded on the Computer Skills Unit/Module Student Evaluation Form (Appendix F).
3. The student will be administered a practical performance examination to determine the level of achievement for the unit/module objectives.

Program Summative Evaluation. Program summative evaluation will be conducted at the conclusion of each workshop.

1. The instructional team will meet and review the instructional materials, organization, and implementation. The

instructional team members will record their summative responses to each of the instructional units on the Teacher Computer Literacy Workshop Program Evaluation Form (Appendix G). The program evaluation instrument provides the opportunity to respond to the instruction using a Likert-type scale that records responses to the specific skills in the domains of relevance and quality. This evaluation instrument is similar to an evaluation format used by the computer researcher Dunn (1985).

2. At the conclusion of the workshop, each student will evaluate the workshop's relevance and quality of presentation using the Teacher Computer Literacy Workshop Program Evaluation Form (Appendix H).

Student Formative and Summative Evaluation. Student formative evaluation consists of instructors' objective observations and evaluations. Activity or lab participation by students at below minimum competency require the instructor to direct the student to re-conduct a lab exercise or tutorial.

When the student feels that he/she has reached minimum competency and instructional observations generally agree, the student will be examined in a practical lab exercise. The instructor will conduct the practical examination. The student will earn either an "Acceptable" or "Non-Acceptable" score. Non-acceptable scored exams may be repeated as many times as the student wishes after first re-operating the particular tutorial or re-conducting the lab exercise on which the exam was based.

Student summative evaluation is the total combined individual "Acceptable" scores. As participants may not participate in all units,

and may elect to by-pass or not participate in any units they wish, each unit is an end-product objective. As each participants selection of objectives may be different, a single overall examination will not be practical or productive.

Revision Procedures

The instructional modules and tutorials have been previously employed in the classroom for the purpose of evaluation and revision. The instructional media and methodology have been revised in response to the original testing. After formative and summative evaluation by the students and instructional team, additional revision may be conducted during presentation of the workshop or after each workshop has been completed.

The instructional media and strategies will be reviewed during unit formative evaluation. Some revision will be accomplished during the workshop, as deemed necessary by the instructional staff. After the completion of each workshop offered, and summative evaluation of that workshop, program materials, media, and strategies, all components of the workshop will be subject to revision.

Concluding Statement

This MARP has provided a practical solution to a clearly identified problem. The information derived from the survey will be presented to the Nevada Vocational Association Journal for publication in the September issue. This provides an immediate avenue for dissemination to vocational teachers and administrators

throughout the state. The Teacher Literacy Workshop has been requested and presented to the University of Arizona system and secondary school districts in Phoenix and Tucson Arizona. The Tucson Unified School District, Tucson, Arizona, scheduled the workshop to be conducted for their vocational teachers June 16, 17, and 18, 1990, and again for their fine-arts teachers in the fine-arts magnet high school, July of 1990.

The Teacher Computer Literacy Workshop was designed for helping vocational/technical teachers develop the computer skills necessary for viable participation in technical education for the 21st. century. The Pennsylvania Amish people, although admirable as a hard-working people, are considered a quaint throw-back to the pre-industrial agricultural era. If the American vocational education systems fails to respond to what Alvin Toffler referred to as the "third wave" or technological era, our once great nation may be referred to as the quaint Amish throw-back by the other nations of the world that have become technologically superior.

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APPENDIX A
COVER LETTER AND COMPUTER USAGE
SURVEY QUESTIONNAIRE



INDUSTRIAL AND SERVICE TECHNOLOGY

EXECUTIVE OFFICES

3200 East Cheyenne Avenue
North Las Vegas, Nevada 89030
(702) 643-6060
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CHEYENNE CAMPUS

3200 East Cheyenne Avenue
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HENDERSON CAMPUS

700 College Drive
Henderson, Nevada 89015-8419
(702) 564-7484
FAX (702) 564-3367

**HEALTH SCIENCES
CENTER**

6375 West Charleston Boulevard
Las Vegas, Nevada 89102
(702) 877-1133
FAX (702) 870-0052

May 7, 1990

Dear Fellow Educator,

The Clark County Community College Computer Graphics Program faculty have been approached recently by several vocational and technical teachers in the college and school district and asked to provide a computer familiarization program with applications related to simple computer design and classroom computer usage. We are very excited about the opportunity to provide this service. However, to accurately design and target such a program for maximum benefit, we need to know the current level of computer usage and skills of the vocational/technical teachers within the service area.

To obtain the information that we need for designing this program we are asking you to complete the computer usage questionnaire that is enclosed. This questionnaire will take less than two minutes to complete and will be very useful for our program design and planning. When you have completed the questionnaire, please place it in the envelop provided and drop it into the college mail addressed to me with the sort code N2B.

Thank you very much for your time, and your cooperation in this survey is very important to us.

Sincerely,

James L. Pomeroy
Instructor of Computer Graphics

Computer Usage Survey Questionnaire

GENERAL INFORMATION:
Subjects Taught _____

 High School Instructor ☐ College Instructor ☐ Both ☐ Industry Trainer ☐

 Male ☐ AGE: 21-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐

 Female ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-above ☐
Professional Training for Technical/Vocational Subject:

 AA/AS College ☐ BA/BS College ☐ Industry/Apprenticeship ☐

 College & Industry Combined ☐ Other ☐ Explain _____

SKILLS AREA:

Directions: If you have a working knowledge of the skills listed below, check the "Yes" box. The assumption is that you use or could use the specific skill at least once a week. Otherwise, check the "No" box.

1. On, Off, Open, Close, and Save?

 YES ☐ NO ☐

Can you turn the computer on and off, load a disk into the machine, open a file in any program or computer language, close a file and save data onto a disk?

2. Word Processing?

 YES ☐ NO ☐

Can you operate a word processing program and print your document on a computer printer?

3. Data-base, Spreadsheet, or Gradebook Program?

 YES ☐ NO ☐

Can you operate or use on a regular basis any one or more of the above listed types of computer applications programs?

4. Programming?

 YES ☐ NO ☐

Can you write a simple computer program using a relatively common computer language like BASIC, Logo, or Pilot?

List other Computer Skills: (Include industry or trade applications.)

5. Did you learn your computer skills before beginning to teach or after?

 N/A or None ☐ Before ☐ After ☐
6. Where did you first learn your computer skills?

 2-Year College ☐ 4-Year College ☐ Industry Schools ☐ On-the-Job ☐ Self-Taught ☐

APPENDIX B
CURRICULUM MODEL EVALUATION FORM

CLARK COUNTY COMMUNITY COLLEGE CURRICULUM MODEL

PROGRAM/COURSE: Teacher Computer Literacy Workshop

	Excellent	Acceptable	Not Acceptable	Missing
1. ANALYSIS				
a. Needs Assessment	☐	☐	☐	☐
b. Task Analysis	☐	☐	☐	☐
c. Student Analysis	☐	☐	☐	☐
2. OBJECTIVES				
a. Program/Course Objectives	☐	☐	☐	☐
b. Unit Objectives	☐	☐	☐	☐
c. Behavioral Objectives	☐	☐	☐	☐
3. INSTRUCTION				
a. Scope	☐	☐	☐	☐
b. Activities	☐	☐	☐	☐
c. Resources	☐	☐	☐	☐
d. Strategies	☐	☐	☐	☐
e. Strategy Rationale	☐	☐	☐	☐
4. IMPLEMENTATION				
a. Organization of Activities	☐	☐	☐	☐
b. Selection of Media	☐	☐	☐	☐
c. Media Selection Rationale	☐	☐	☐	☐
5. EVALUATION				
a. Techniques Described	☐	☐	☐	☐
b. Developmental Testing	☐	☐	☐	☐
c. Unit Formative/Summative	☐	☐	☐	☐
d. Student Formative Summative	☐	☐	☐	☐
6. REVISION	☐	☐	☐	☐

Date of Program Evaluation: 126 Evaluator: _____

APPENDIX C
PRE-ASSESSMENT FORM

COMPUTER SKILLS PRE-ASSESSMENT

Name: _____ **Subjects Taught:** _____

1. On, Off, Open, Close, and Save?

YES NO
☐ ☐

Can you turn the computer on and off, load a disk into the machine, open a file, close a file and save data on a disk?

2. Word Process?

YES NO
☐ ☐

Can you operate a word processing program and print your document on a computer printer?

3. Data-base, Spreadsheet, CAD, or Gradebook Program?

YES NO
☐ ☐

Can you operate or use on a regular basis any one or more of the listed programs?

4. Program?

YES NO
☐ ☐

Can you write a simple computer program using a common computer language like BASIC, Logo, or Pilot?

5. List Other Computer Skills:

APPENDIX D
PERFORMANCE OBJECTIVES

Teacher Computer Literacy Workshop

Behavioral Objectives

PERFORMANCE OBJECTIVES	ACTIVITIES / METHODOLOGY
I. COMPUTER LITERACY Hardware Literacy, Computer Mouse Operation, and Pull-Down Menus A. Students will identify basic terminology related to computer operation. B. Students will identify basic computer parts and functions. C. Students will demonstrate basic computer functions. D. Students will demonstrate mouse operations and pull-down menu functions.	A1. Students will read text materials containing terminology related to computer literacy. A2. Instructor will explain terminology and demonstrate specific applications of terms. B1. Student will read text materials containing terminology related to computer parts. B2. Instructor will demonstrate basic computer hardware functions. B3. Students will complete physical drill identifying the basic computer parts. C1. Students will demonstrate proper operational procedures for keyboard entry PC computer systems. Procedures: - Power-up - Open programs or files - Format Disks - Save data - Close programs and files. - Shut-down system C2. Students will complete literacy tutorials for I.B.M. PC computers. C3. Students will perform simulation drills to practice procedures. C4. Students successfully complete practical exam evaluation of procedures. D1. Students will study text materials and record lecture notes relating to computer mouse and pull-down menu terminology. D2. Instructor will lecture on mouse terminology and operation and pull-down menu terminology and operation.

PERFORMANCE OBJECTIVES	ACTIVITIES / METHODOLOGY
I. COMPUTER LITERACY (Continued) D. Students will demonstrate mouse operations and pull-down menus.(Continued)	D2. Procedures: a. Power-up b. Shut-down c. Load, Save, and Close D3. Students will complete mouse and pull-down menu tutorial "A Guided Tour of Your Macintosh". D4. Students will complete tutorial "On, Off, Open, Close, and Save". D5. Students will successfully complete practical exam evaluation of procedures.
II. WORD PROCESSING A. Students will demonstrate skill competency with one word processing program. B. Students will demonstrate competency in generating and manipulating text.	A1. Students will read text materials related to subject. A2. Instructor will explain terminology related to word processing. A3. Instructor will demonstrate word processing program. A4. Students will perform practice drills with word processing program. A5. Students will operate "Word Processing Instructional Tutorial". B1. Students will generate a two page document. B2. Students will perform a practical examination of word processing procedures.
III. COMPUTER MANAGED INSTRUCTION A. Students will demonstrate skill competency in operating a gradebook, student management, or spreadsheet program.	A1. Students will read text materials related to the terminology and operation of a student management or spreadsheet program. A2. The Instructor will demonstrate the gradebook, or spreadsheet program. A3. Students will perform practice drills with gradebook, student management or spreadsheet programs.

PERFORMANCE OBJECTIVES	ACTIVITIES / METHODOLOGY
III. COMPUTER MANAGED INSTRUCTION (Continued) B. Students will enter demographic data and statistical parameters into the program and generate data reports from the program.	B1. Student will organize and assemble a sample class gradebook with student data. B2. Student will generate data related to the sample class. B3. Student will successfully complete a practical exam evaluation of procedures.
IV. COMPUTER DESIGN A. Students will demonstrate competency in operating a basic draw/paint program. B. Students will draw straight and freehand lines, manipulate textures, shades, and geographic shapes.	A1. Students will read text materials related to terminology and operations of basic illustration programs. A2. The instructor will demonstrate the draw/paint program. A3. Students will perform practice drills with draw/paint programs. B1. Student will generate an original piece of artwork with a draw/paint program. B2. Student will successfully complete a practical exam evaluation of procedures.
V. COMPUTER GENERATED INSTRUCTIONAL MATERIALS A. Students will demonstrate skill competency in operating a page assembly(desktop publishing) program. B. Students will manipulate text and graphics by importing into the program or generating elements in the program.	A1. Students will read text materials related to unit. A2. Instructor will explain terminology and demonstrate procedures related to page assembly. A3. Students will operate the desktop publishing tutorial "Campus Chronicles." B1. Students will create a letterhead document using a page assembly program. B2. Students will successfully complete a practical examination that demonstrates competency level of procedures.

APPENDIX E
LAB ASSIGNMENTS

TEACHER COMPUTER WORKSHOP

Lab Assignment: Tutorials

Assignment Objectives

1. A primary objective is to have the individual learn how to operate the mechanical hardware aspects of the computer, to include power switch, disk drives, and keyboard.
2. The student will learn to open programs and files, format disks, save data to disks, and close programs and disks.
3. The student will learn to operate the computer mouse to manipulate the windows and pull-down menus environment.
4. To accomplish these objectives, the student will perform the introductory tutorials for IBM and Apple Macintosh computers.

Assignment Explanation

1. Read the computer tutorials "On, Off, Open, Close, and Save for the IBM-PC" and for the Apple Macintosh. Use these documents to review simple functions that are easily forgotten or confused by over-saturation of computer information.
2. Perform and complete "A Guided Tour of Your Macintosh." After this tutorial is completed, perform and complete "The IBM Tutorial." These tutorials must be completed before any other computer functions can be accomplished. If you tire in the middle of a tutorial, make note of your location and quit the system.
3. This is probably the most important step in learning how to use a computer. There are three guidelines for success. **1. Take your time. 2. Make notes to yourself about problem areas or functions that you feel you will use often. 3. Ask questions.**

TEACHER COMPUTER WORKSHOP

Lab Assignment: Research Paper

Assignment Objectives

1. This assignment is designed to require you to operate in three domains. The first domain is basic written communication. You must write a short paper with correct grammar and spelling.
2. The second domain deals with scholarly or technical writing. Somewhere in school or on the job, you will be required to write a paper about technical issues. This assignment will outline simplified footnote and documentation procedures.
3. The third domain deals with word processing on the computer. To be current in today's world, and probably merely to survive in tomorrow's world, you must be able to use a computer to word process. This assignment will allow you to use a word processor, operate several format characteristics, and create a multiple page document.

Assignment Explanation

1. This assignment will require you to write a technical paper that is three pages in length. The text need only be two pages in length as the last page is the reference list of the magazines or books used.
 2. The paper must follow the format indicated on the format sheet. the text will be ten-point size and any laserfont typeface you prefer. The title of the paper and the documentation headline must conform to the style outlined.
 3. First, you must read at least two different magazine articles or two different books on the same subject related to some aspect of the computer. You may read two articles from the same magazine such as PC Magazine, but both articles can not come out of the same month's issue. The information from these articles will be written and organized in your own words. Do not copy word for word unless you footnote.
 4. You must adhere to all traditional English writing conventions. All sentences must start with a capital letter and end with a period. Avoid run-on sentences, misused commas, and misspelled words. Use the spell-check capabilities of the program. Each page will have a page number at the bottom of the page.
 5. This assignment can be accomplished on any computer or printer as long as the computer, printer, and word processing program is identified in the documentation headline.
-

TEACHER COMPUTER WORKSHOP**Lab Assignment: Gradebook Program**

Assignment Objectives

1. The primary objective of this assignment is to provide the opportunity to organize and assemble an electronic gradebook for a class.
2. This assignment provides the opportunity to generate student documentation and performance data using a computer program.

Assignment Explanation

1. Review at least three gradebook programs and select a gradebook or spreadsheet/database program that will operate on a computer available in your school environment.
 2. Enter a sample student population of twenty students. Record names, identification numbers, and sample grades. Use the program to add and average grades using either a point system entry or a letter grade system entry.
 3. Use the data generation functions of the computer program to generate a grade or status sheet for the entire class. Additionally, use the program function to generate a status report or report letter for the student or parent to indicate unsatisfactory progress.
 4. Duplicate this process with as many different program and computer combinations as are available in your school environment.
-

TEACHER COMPUTER WORKSHOP**Lab Assignment: B&W Draw/Paint Program**

Assignment Objectives

1. The primary objective is to learn to successfully operate a black and white computer design draw or paint program. Operation of the program includes use of the freehand tools, geometric tools, lines, and textures.
2. The successful operation of the design program requires the creation of a whole page design. Freehand artistic drawing is not required. This assignment can be completed with the use of geometric drawing tools if desired. This assignment must demonstrate application of most of the available tools in the program.

Assignment Explanation

1. Select a black and white draw/paint program. For the Macintosh computer, the recommended programs are MacDraw, MacPaint, FullPaint, or SuperPaint. In the IBM environment, you must get program approval from the instructor.
2. Create a full page design using the majority of the available tools. Paint programs generally use a screen that represents only about one-third of the entire 8 and 1/2 by 11 page. Think in terms of the entire page during the design process. Scroll the screen to the top or bottom of the page before beginning the design.
3. Freehand creative drawing is not required, however use of the freehand pencil tool is required at least once in the design, even if only in a small way. Using line and geometric tools as a substitute is an excellent replacement. An abstract collection of textures and shapes is acceptable as long as a majority of the program tools have been utilized.

TEACHER COMPUTER WORKSHOP

Lab Assignment: "Campus Chronicles"

Assignment Explanation

1. This assignment is the first tutorial for Aldus PageMaker®. It is designed to allow you to operate most of the common functions of PageMaker in one simple assignment. PageMaker's primary function is that it is an assembly program that allows you to import art and text from other sources and assemble them quickly in a variety of formats. This particular tutorial will only operate on an Apple Macintosh. It is not IBM compatible.
2. This tutorial assumes that you can already turn on the machine, turn it off, operate the disk drives, and perform most basic functions with pull-down menus. As you go through the tutorial, if you have difficulty you are probably moving ahead too rapidly and are not carefully reading every word of the instructions.
3. PageMaker can only operate from a hard-drive system. Therefore, particular care must be taken when saving a document to insure that you do not ever save on the hard-drive, but that you save only on your data disk. Accidentally saving into the PageMaker program can cause the program to crash. To insure that this doesn't happen, when saving for the first time, select the **Save As...** command from the **File** menu. When the **Save As...** dialogue box opens, look carefully at the disk/program name over the top of the listed items. If your data disk name is not in that box, **Do not save until you have clicked your mouse pointer on the Drive box.** This will open your data disk. You must see the name of your data disk before saving! You may now safely name the document and select "OK."
4. To receive the maximum personal benefit from this tutorial, pay particular attention to the operations that deal with the **Place** command in the **File** menu. Practice using the tools in the tool-box. Pay additional attention to the text modifying abilities of the program. This will allow you to generate large amounts of copy in a word-processing program and then modify or change elements in the copy after it has been imported into PageMaker.

TEACHER COMPUTER WORKSHOP

Lab Assignment: LetterHead

Assignment Objectives

1. The objective is to create a letterhead stationary using PageMaker and a draw program or clip-art. This stationary may be for an individual or a business. If you don't wish to make stationary for yourself personally, or if you don't have a business, an imaginary business may be created for this assignment. The letterhead must have a piece of art, and laser-font lettering.
2. The letterhead requires the application of simple art that may be created or drawn in any standard draw or paint programs such as MacDraw, MacPaint, FullPaint, or SuperPaint or imported from clip-art.
3. The lettering on the letterhead must be generated in PageMaker using a typeface that is laser quality. A basic rule of thumb is that any typeface name that has the name of a city is not a laserfont and will print bit-mapped.

Basic Procedures

1. The first part of the process is to plan the design and layout by sketching out a few ideas until a concept is firm. Determine the individual elements. Pick a typeface and make a sample print of several sizes, standard, bold, and italic typefaces. Decide if you wish to use graphic elements from the PageMaker program. Consider tool-lines, and boxes.
2. After the design has been determined, create or select the artwork. If the art work is drawn, create the work in the draw or paint program and save the art on your disk with a name that you will recognize later for import into PageMaker. If clip-art is to be used, clip-art files or disks must be selected. After the clip-art is selected, it must be named and saved as a paint program document on your disk.

Using Clip-Art

1. Selecting clip-art out of a clip-art file is a specialized skill. To do it successfully you must first open the clip-art file or disk to see the available images. Clip-art will only open if a paint program is installed on the machine hard-drive. The clip-art needs this master program to manipulate the images. If you do not have a hard-drive and you are using two floppy disk-drives, a paint program must be in one disk-drive and the clip-art disk in the other. The paint program must be opened first and the clip-art file opened using the **Open** command from the **File** menu.

2. If you open a clip-art file that has birds, you will usually see several birds on one page. As you probably only need or want one bird, you will need to select that object out of the page without selecting un-wanted items. Select the **Lasso** command box. The pointer will become a lasso. Holding down the mouse button, carefully move the lasso around the object that you wish to select. Make sure that the line that the lasso draws crosses itself at the end. When you release the mouse button, the selected object will flicker.
3. While the art object is flickering, go immediately to the **Edit** menu and select **Copy** in the menu file. **Never** use the **Cut** command as it will permanently remove the object from the clip-art file, and it can never be used again. Once the art has been selected and copied, the art is placed in the computer temporary memory. This memory is usually referred to as the **Clipboard** in the Macintosh environment. To permanently save this art to disk, you must first close the existing document or file, but do not close the program.
4. Go to the **File** menu and select **Close**. After the clip-art file is closed, go back to the **File** menu and select **New**. This will open a new untitled page. Go to the **Edit** menu and select **Paste** from the menu. The clip-art that you selected from the clip-art file will appear on the page. Go to the **File** menu and name this art using the **Save As...** command. You now have the artwork saved in a program that can be imported into PageMaker.

Assembling the Elements

1. With the PageMaker file opened, select and place the artwork first. This is accomplished by going to the **File** menu and select **Place** from the menu. The dialogue box will first show the PageMaker Program menu. Select **Drive** in the dialogue box to open your data disk where the artwork is saved. With your data disk identified in the drive window, select the name of the artwork and select. The artwork will appear in the middle of the page. Place the pointer arrow in the center of the art, press the mouse button and move the artwork around to place it where you want it.
2. After the artwork is placed, generate the copy. To do this, it is easier to accomplish with the page at **Actual Size**. After all of the copy is generated and placed, add any tool-lines or boxes from the PageMaker menu.

APPENDIX F

COMPUTER SKILLS UNIT/MODULE STUDENT
EVALUATION FORM

COMPUTER SKILLS UNIT/MODULE STUDENT EVALUATION

Name _____

Date: _____

COMPUTER LITERACY

	YES	NO
1. Turn the computer on and off?	_____	_____
2. Insert and eject disks?	_____	_____
3. Open and Close files from disks?	_____	_____
4. Load programs from hard drive?	_____	_____
5. Save data to disks?	_____	_____
6. Format disks?	_____	_____
7. Did you accomplish the objectives for this unit that you wished?	_____	_____
8. Indicate the objectives for this unit that you did not achieve and evaluate the unit overall.		

COMPUTER MOUSE OPERATION and PULL-DOWN MENUS

	YES	NO
1. Operate mouse functions to open and close disks?	_____	_____
2. Operate pull-down menus to open and close files?	_____	_____
3. Operate mouse functions to save data eject disks?	_____	_____
4. Complete "On, Off, Open, Close, and Save" on Macintosh?	_____	_____
5. Did you accomplish the objectives for this unit that you wished?	_____	_____
6. Indicate the objectives for this unit that you did not achieve and evaluate the unit overall.		

COMPUTER SKILLS UNIT/MODULE STUDENT EVALUATION

Name _____

Date: _____

WORD PROCESSING

	YES	NO
1. Open and close word processing program?	_____	_____
2. Enter type, change font and font size?	_____	_____
3. Change line space and word justification?	_____	_____
4. Perform pagination and spell-check?	_____	_____
5. Generate a multiple page document?	_____	_____
6. Save data to disks?	_____	_____
7. Did you accomplish the objectives for this unit that you wished?	_____	_____
8. Indicate the objectives for this unit that you did not achieve and evaluate the unit overall.		

COMPUTER MANAGED INSTRUCTION

	YES	NO
1. Open and close program and save data to disk?	_____	_____
2. Enter student demographic information?	_____	_____
3. Set statistical parameters and generate statistical information?	_____	_____
4. Generate student data reports?	_____	_____
5. Did you accomplish the objectives for this unit that you wished?	_____	_____
6. Indicate the objectives for this unit that you did not achieve and evaluate the unit overall.		

COMPUTER SKILLS UNIT/MODULE STUDENT EVALUATION

Name _____

Date: _____

COMPUTER DESIGN

	YES	NO
1. Open and close word draw/paint program?	_____	_____
2. Enter type, change font and font size?	_____	_____
3. Use line, pencil, brush, and spray tools?	_____	_____
4. Use shape tools and selective textures?	_____	_____
5. Manipulate, duplicate, or move shapes or page sections?	_____	_____
6. Save data to disks?	_____	_____
7. Did you accomplish the objectives for this unit that you wished?	_____	_____
8. Indicate the objectives for this unit that you did not achieve and evaluate the unit overall.	_____	_____

COMPUTER GENERATED INSTRUCTIONAL MATERIALS

	YES	NO
1. Open and close program and save data to disk?	_____	_____
2. Set-up page design or format?	_____	_____
3. Import text and graphic elements into page?	_____	_____
4. Use program tools to modify or create text or graphics?	_____	_____
5. Did you accomplish the objectives for this unit that you wished?	_____	_____
6. Indicate the objectives for this unit that you did not achieve and evaluate the unit overall.	_____	_____

APPENDIX G

TEACHER COMPUTER LITERACY WORKSHOP
PROGRAM EVALUATION FORM

TEACHER COMPUTER LITERACY WORKSHOP
Program Evaluation

Name: (Optional) _____ Date: _____

Please indicate your evaluation of the total workshop or course. Please use the rating scale as indicated below.

Rating Scale:	Poor 1	Fair 2	Good 3	Very Good 4	Excellent 5
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[illegible]

Comments and Suggestions: Please indicate any comments, suggestions, or recommendations that you might have about any of the aspects of this workshop. How could this workshop be improved?

BIOGRAPHICAL SKETCH OF THE STUDENT

James L. Pomeroy

James Pomeroy was born November 23, 1949 in Minden, Nevada and later attended public school in Carson City and Las Vegas, Nevada. After graduating from Nevada Southern University in 1968 with a B.A. in Art and English, James entered the United States Army and served as a combat photographer during the Viet Nam War. After returning to civilian life, Mr. Pomeroy taught art, crafts, and photography Von Tobel Junior High School in the Clark County School District, Las Vegas Nevada.

James began teaching high school at Eldorado High School in Las Vegas in 1974. From 1974 until 1987, he taught art, crafts, vocational commercial photography, television production, journalism, publications, advised the school newspaper and yearbook. As the advisor for the school chapter of the Vocational Industrial Clubs of America for five years, Mr. Pomeroy's photography students were national gold or silver commercial photography competition winners for five straight years. In 1976, James earned a Master of Education in Curriculum and Instruction at the University of Nevada, Las Vegas.

Beginning as an adjunct instructor in photography for the Clark County Community College in 1974, James accepted a full-time college instructor position in commercial photography and computer graphics in 1987. James entered the Nova University Ed.D. program in 1988, with a specialization in Vocational, Technical, Occupational Education.